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GEOGRAPHY FOR SENIOR CLASSES

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GEOGRAPHY

FOR

SENIOR CLASSES

BY

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FELLOW OF THE ROYAL GEOGRAPHICAL SOCIETY
INDIAN EDUCATIONAL SERVICE (RETIRED)

WITH MAPS IN COLOUR
AND ILLUSTRATIONS IN BLACK AND WHITE

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PREFACE

Geography for Senior Classes is the third of a series of geographies by the Author on the Concentric system, the two earlier books being *First Lessons in Geography* and a *Geography for Junior Classes.* It is intended for the two senior forms of High Schools, in which boys are preparing for the "School Final" or "School Leaving Certificate" examination, or for Matriculation. It has been divided into two parts in deference to the instructions of the Educational Department, for whom the series was primarily written. About half of the lessons on "general geography," including physiography, have been put into Part I. for a first year's course, and the other half, rather larger, into Part II. for the second year.

Part I. contains lessons on the shape and structure of the Earth, its crust, its movements, and its relations to the sun and moon; the causes of day and night, and the seasons; the formation of Mountains, Volcanoes, and Earthquakes; a few elementary facts regarding the Solar system, especially the moon, and a lesson on Map-making. The rest of the first-year course includes a somewhat detailed description of India and the British Isles.

Part II. begins with an account of Rivers and their work. Then follow lessons on the formation of Valleys and Plains; of the Air and its movements, Winds, Temperature, Isotherms, the Ocean and its movements, its tides and currents; Climate and its factors and the chief climatic regions of the earth; some World Features; the Races of Mankind; Plants and Animals; and a lesson on the origin and growth of Towns. The rest of Part II.

is an account of the continents and their countries, based upon the physical features and natural regions of each continent.

There are, however, many head masters who consider that a study of the general principles of physiography—of climate, the winds, currents, tides, and so forth—should precede that of the particular application of these principles to the various countries of the world, and would prefer to go over the whole of the physiography before taking up, *e.g.*, India and the British Isles. This can easily be arranged, as the book is in one volume, by going direct from Lesson 16 to Lessons 46-61 and then taking the continents in any order that may be considered convenient.

As to the size of the book, it may be noted that the text to be studied is by no means so much as the number of pages, about 500, might suggest. In the first place, there are quite 50 pages of maps. There are also over 200 pictures and diagrams, including about 75 illustrations of fauna and flora. About one-quarter of the book is occupied by maps and illustrations. The Author, after an experience of about forty-five years in teaching geography to thousands of students, of examining hundreds of schools, and of writing numerous geographies which are very widely used in India, has no hesitation whatever in stating that the contents of this book may easily be mastered in two years by boys in High School classes.

It must be remembered that this series of geographies is on the Concentric system. Much of the work is revision of what has already been done. This book merely adds details to information already imparted, and expands and illustrates more fully principles which have already been grasped. For example, as to the names of places: in the *First Lessons* a boy learns the names of one or two towns in a country; in the *Geography for Junior Classes* he is taught the names of two or three more so that he now knows four or five. In the *Geography for Senior Classes* he meets with seven or perhaps eight or even more names in the same country, but most of these he knows already. They are old friends. He is given an additional detail or two. But of new names he has not more than two or three, or it may be four or five, to learn and to remember.

Good maps are essential to a good geography. The ugly daubs and blotches of black which disfigure more than one recent book, written on so-called "modern lines," are of very little real use. The maps in this book have been produced by some of the best map-makers in England. The name of Bartholomew is a guarantee of the accuracy and excellence of the coloured maps. Some otherwise good geographies have no maps at all. We are told, in these books, that every student ought to have an Atlas and to refer to it. But the multiplicity of names, most of them in very small print, in an ordinary Atlas, appals and repels the schoolboy, who is often unable to find the particular name he wants. And the cost of an additional book is a serious consideration to most Indian students. As Humboldt long ago said, the best maps are those with the fewest names. As in the other books of the series, the maps in this geography contain the names in the text and very few more. There are large coloured double-page maps, physical and political, of all the continents, and, in addition, a map of every country in the world, and one of every province in India, all of full-page size, some being double-page

The geographies written thirty or forty years ago contained little more than long lists of names and unconnected and isolated facts to be "learnt by heart." These old books were truly *dry as dust*, and some modern geographies, with their mathematical problems, geographical "exercises," long sets of questions, tables of statistics in the text, and lengthy lists of figures of exports, imports, and products, are, to the schoolboy, *drier than dust.* All these details and exercises would be quite in place in a Teacher's Handbook. To put them into a book to be read by boys is to render the geography lesson the most detested in the whole syllabus.

A book for boys ought, above all things, to be interesting and attractive, and the style should be simple. Any technical terms used should be explained in words familiar to them, such as they use and can understand. A feature of this book is the large number of illustrations of wild animals. These are scarcely ever found in books published in England, although they fill pages in the far more attractive books written in America.

Natural history is interesting to nearly all boys, but it does not, as a rule, find place in the curriculum of any Indian High School. The only chance a boy has of learning, *e.g.*, what an ostrich or a kangaroo is like, is from the geography lesson.

The Author has found that invaluable compendium of information, *The Statesman's Year Book* (for 1916), of the utmost help, as well as the *Colonial List* for 1915–16. He is also much indebted to the *International Geography*, a perfect storehouse of geographical information, and to the works of Professors J. W. Gregory and Lyde, and to the Oxford Survey of the British Empire. In Physiography the facts are taken from the works of Geikie, R. A. Gregory, Huxley, Lockyer, H. R. Mill, and Balfour Stewart, all of them pure gold.

The facts, figures, and details relating to the geography of India have been taken from the latest edition of the *Imperial Gazetteer* and from the Statistical Tables published annually by the Government of India.

In this revised edition, being the fifth reprint, all statistics have been brought up to date (in accordance with the census returns of 1921), and the changes made in the political arrangements of the work as a result of the Great War of 1914–1918 have been duly noted.

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GEOGRAPHY FOR SENIOR CLASSES

PART I

1. THE EARTH.

In very early times all men believed that the earth was a vast flat plain with hills and mountains rising on it here and there, and that it was encircled by the ocean. They thought that the sky was a great dome or vault of blue, resting on the earth, and that the stars were fixed in the dome, which went round and round. The sun, the moon, and the planets seemed to them to move across the sky-dome, while the great earth-plane stood still below them.

But now we know that the earth is a great spinning ball or globe that is for ever revolving round the sun. The surface of a globe is curved. That the surface of the earth is a curve may be shown in many ways.

Stand three rods of the same length, say 7 feet, upright on corks floating on a lake, in a straight line, so that the first rod I may be two miles apart from the third rod III, and the second rod II exactly in the middle. Fix a white ball on the head of each rod. Then look along the three balls through a telescope at one end of the line. If the surface of the water were on the same level, the three balls would be on the same level, like this:

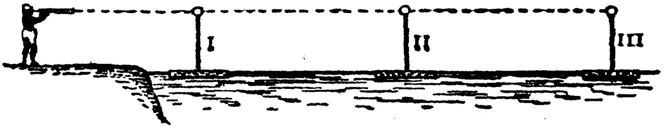


FIG. 1.

But it is not so. You will find that ball II is about 8 inches above the level of the other two balls, like this:

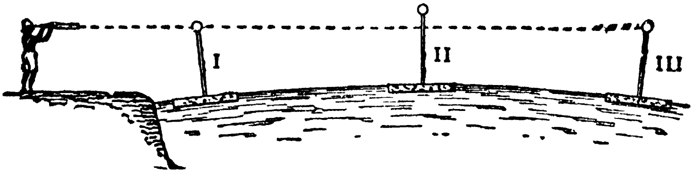


FIG 2.

This shows that the surface of the water rises up in the middle. It is a curve. Everywhere, on the water or on a flat piece of land, there is an upward curve of 8 inches between any two points two miles apart.

The edge of the shadow of the earth is a curve, as any one may see for himself in an eclipse of the moon, when the shadow of the earth is cast upon the moon.

If a ship sail round the earth, keeping in the same direction all the time, it will at length come back to the place from which it started, just as an ant or a fly, crawling over an orange, comes back to its starting-point. This the ship could not do unless it were sailing in a circle round a globe.

When we stand on the shore of the sea and watch a ship moving away from us, we can see the sails or the funnels and the masts some time after the hull has sunk out of sight. If the surface of the sea were flat, we should see the hull longest, as it is the largest and most bulky part of the vessel.

If the earth were flat, the rising sun would be visible everywhere at the same time. But instead of this, the sun rises later and later as we go westwards, and earlier and earlier as we go eastwards. And the same stars would be visible everywhere every night if the earth were flat. But as we travel northwards or southwards, many stars sink out of sight, being hidden from view by the upward curve of the earth's surface.

The circle that a man sees around him on the land or on the sea, where the sky seems to meet the surface of the land or water, is called the horizon. Everywhere, if the eye be 5 feet above the sea-level, the horizon is about 2¼ miles away. From 8 feet above the level of the sea, the horizon is 3 miles off. If a man climbs a height, he can see farther and farther, and the horizon gets wider and wider. At the height of 5600 feet a man can see 80 miles all round him. At the height of 24,000 feet the horizon is 160 miles off. The higher one goes, the wider is the horizon, and everywhere it is a perfect circle round the point of observation in the centre. This could only be the case on the surface of a globe.

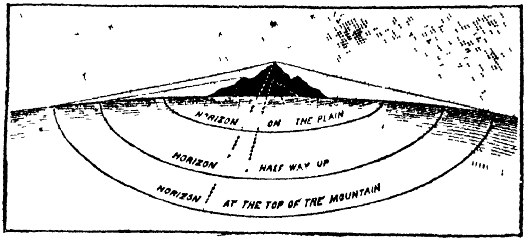


FIG. 3.

The sun, the moon, and the planets are all globes, as we can see for ourselves. The earth is a planet, and it is not likely that its shape would be different from that of all other heavenly bodies.

For these reasons we know that the surface of the earth is everywhere curved, that it is therefore a globe or sphere. Like the sun, moon, and stars, it rests on nothing, and hangs from nothing. It floats freely in space.

2. ROTATION OF THE EARTH: ITS SHAPE.

DAY AND NIGHT.

THE great earth-ball is for ever spinning round and round. This movement we call *rotation*. The earth rotates round an imaginary line through its centre, which line we call its *Axis*. The axis does not move, the earth moves round it.

The two points at the ends of the axis are its *Poles*. If we draw a line right round the surface of the earth, midway between the poles, it will divide it into two equal parts. This line we call the *Equator*. Each half is called a hemi-sphere or half-sphere.

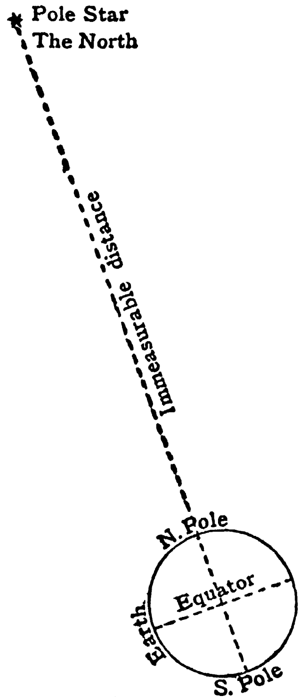


FIG. 4.

As the earth rotates round its axis, the axis itself always points towards a star in the heavens, a star so far away that we cannot measure its distance from the earth. It is called the Pole Star or North Star. The pole of the earth's axis, that points towards it, and is the nearer to it, we call the *North Pole*. The other end of the axis, which points away from it, is the *South Pole*.

It takes just 24 hours for any point on the earth to go right round—to rotate once. Opposite to the rotating earth there is the great glowing orb of the sun. It is about 93 millions of miles away, but its rays bathe the earth in light and heat. As the earth spins round, every point on its surface comes into the sunlight in the morning, moves round in the sunlight all day, and at night slips away into the dark. One half of the earth is always in the sunlight, and here it is day. The other half is at the same time in the dark, and here it is night.

Thus we see how the rotation of the earth on its axis, opposite the sun, causes day and night.

The earth rotates from west to east. As each point in turn spins eastwards into the sunlight, the sun is said to rise there, *i.e.* in the east, and as it spins out of the light westwards, the sun is said to set there, *i.e.* in the west.

That the earth rotates from west to east has been proved in many ways. If a stone be dropped into a very deep, narrow well, it does not fall into the water at the bottom, but strikes against the eastern side of the well. In the same way, a stone dropped from the top of the east face of a high tower falls to the ground a little to the east of the point just underneath This shows that the earth is spinning from west to east.

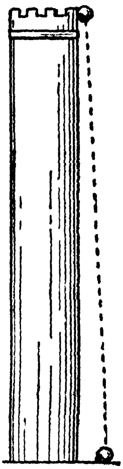


FIG 5.

The Exact Shape of the Earth.—The earth is a globe or sphere, but not a perfect sphere. In a true sphere, as in a circle, every radius, every line from the centre to the circumference, is exactly equal. But it has been found that the earth-globe is slightly flattened at the poles, and bulges out slightly at the equator. The circumference of the earth is 24,900 miles, or in round numbers 25,000 miles at the equator.

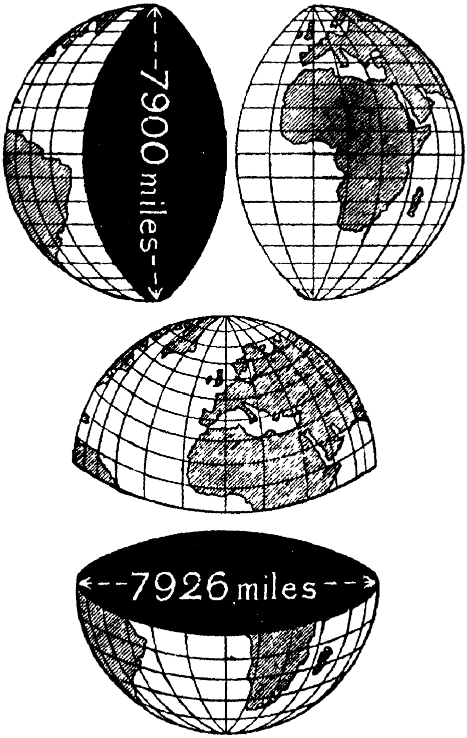


FIG. 6.

The diameter through the centre at the equator is 7926 miles, but the diameter from the North to the South Pole, through the centre, is 26 miles shorter, being about 7900 miles. A body very like a sphere is called a *spheroid*, and a spheroid, flattened slightly at the poles, is said to be *oblate*. Thus the earth may be called an *oblate spheroid*.

We know this by actual measurement. And we know that any globe, made of any material, solid or liquid or gas, will flatten at the poles and bulge out in the middle if it be made to spin rapidly round on its axis. Also we see that the other planets and the moon, which, like the earth, are all spinning globes, have this shape—they are all oblate spheroids.

Points of the Compass.—The two points, North and South, on the earth's surface, are fixed by the two ends of its axis, *i.e.* by the North Pole and the South Pole. And two other points, East and West, are fixed for us by the rising and the setting sun. These four are called the four cardinal or chief points. They are also known as points of the compass. The word compass means *circle.* We may divide into two the spaces between each pair of these points, and thus get four more points as shown in Fig. 7. Midway between north and east there is the north-east, marked N.E. Between north and west lies the north-west or N.W. Between south and east there is the south-east, marked S.E. And between south and west there is the south-west or S.W.

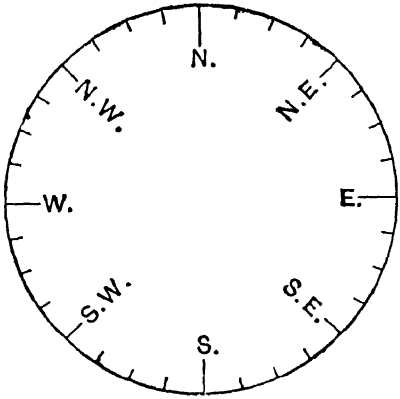


Fig 7.

There are still smaller subdivisions made on a mariner's compass, some of which are marked, though not named, in Figs. 7 and 8.

On a bright clear night we can tell where the north lies by the Pole Star. But often we cannot see the stars because of clouds or fogs in the sky. Is there no other way of finding the north and the south? There is.

There are stones known as *magnets*, so called because they are found chiefly in Magnesia in Asia Minor. These stones have a wonderful force called magnetism. They *attract* or pull iron towards them. If a magnet be held close to small pieces of iron, they jump to the magnet and cling to it. If the magnet be held up, they hang from it and do not drop off. And if a long magnet be suspended by a string, one end will always point to the north and the other end to the south. For this reason these stones are also called *lode-stones*, *i.e.* leading stones, because they lead to or point out the north. If a piece of iron or steel be gently rubbed or stroked with a lode-stone it becomes a magnet, and will also attract iron or steel and point to the north. It is said to be magnetised. If a steel needle, which has been magnetised, be placed on an upright pin, so that it can move round freely, one end will always point to the north and the other to the south.

In Fig. 8 we see a compass. It is a little box with a glass top to it. Inside there is a circle, on which are marked the eight points of the compass which have been mentioned. There is the magnetic needle on a pin, pointing to the north.

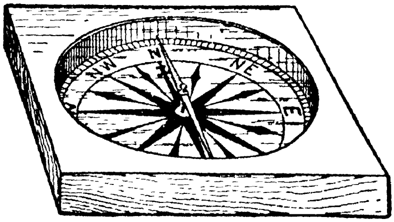


FIG 8.

Before the compass was invented, ships were afraid to sail out on the wide ocean, for if they could not see the sun on a cloudy day or the stars on a foggy night, they could not find their way. Now every ship carries a "mariner's compass," and with its aid the mariners or sailors can find their way anywhere over the trackless ocean.

3. LATITUDE AND LONGITUDE.

THE surface of the earth being curved, distance over it is measured by *circular measure*. The circumference of every circle, great or small, may be divided into 360 equal parts called degrees. One degree is written 1°, two degrees are written 2°, and so on. A degree is divided (like an hour) into 60 parts called minutes, marked ′, and every minute is divided into 60 parts called seconds and marked ″. Degrees, minutes, and seconds in circular measure do not show time, but distance or length. The length in miles of a degree depends on the size of the circle of which it is a 360th part.

A half circle, or semicircle, contains 180°, and a quarter circle or quadrant, contains 90°.

The circumference of the earth is a circle. Any line which goes right round the earth measures about 25,000 miles. One degree of a line like this measures 25,000 ÷ 360, *i.e.* about 69 miles. The distance from the equator over the surface of the globe to either pole is a quarter circle or 90°, and the distance from pole to pole is a semicircle or 180°.

Great Circles.—Any number of circles may be drawn round the earth *from north to south* passing through the poles. Each of them would be a "great circle," and a degree along it would measure 69 miles. Only one "great circle" can be drawn round the globe from *east to west.* This is the equator. It measures about 25,000 miles, and the length of 1°, measured east and west along the equator, is about 69 miles.

Any number of circles may also be drawn round the globe from east to west parallel with the equator. But they will not be great circles. The North Pole is an imaginary point. If we draw a circle on the face of the globe just below the North Pole, the pole being the centre, it will be a very small circle. If it be drawn, say, half a mile from the pole, it will measure 3 miles round, so that each degree will be about 45 feet in length. A point on this line will take 24 hours to rotate 3 miles. We may go on drawing circles one below another. Each of them will be larger than the circle above it, and each may be divided into 360°. The length of a degree will be longer and longer as the circles get larger and larger. At a point 20° from the North Pole, a degree of one of these circles would measure 23½ miles; at 40° it would measure 44½ miles; at 70° it would measure 65 miles, and at the equator itself, which is 90° from the pole, it would measure 69 miles (nearly). As the earth spins

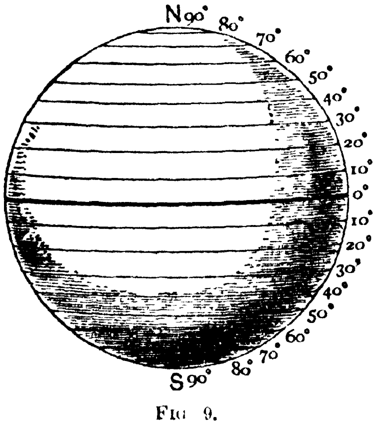


FIG. 9.

round, every point upon it is spinning round with it. Near the pole, as we have seen, a point is carried round at the rate of 3 miles in 24 hours, *i.e.* 1 mile in 8 hours. This is its *velocity*, *i.e.* the rate at which it moves. It moves very slowly. But at the equator every point on the surface is carried round 25,000 miles in the same time, *i.e.* at the rate of more than 1000 miles an hour. The velocity is far greater. A boy in Bombay is travelling round with the earth at the rate of about 16 miles every minute, while a boy in London is doing only 11 miles in the same time.

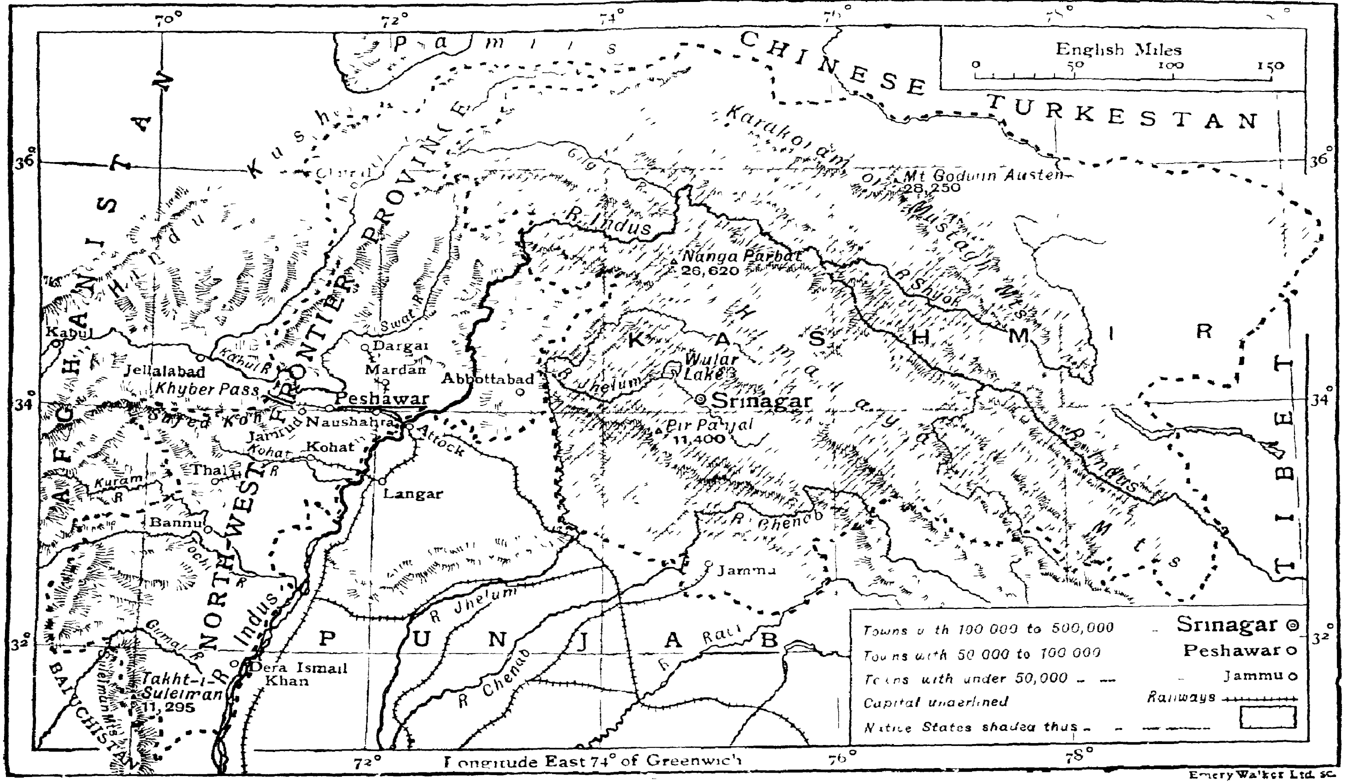
In the same way, we may draw circles, one above another, from the South Pole, which is a point, as the centre. These circles will get larger and larger till we reach the equator, which is, as we have seen, the largest circle that can be drawn from east to west round the earth. As in the northern hemisphere, the velocity of any point on the surface of the spinning globe is very low near the South Pole and greater and greater up to the equator.

This fact, that the velocity of the spinning earth is so much greater at the equator than at the poles, has a great effect, as we shall see, on the winds and rain, and so, on climate.

As all these circles north and south of the equator are parallel to one another and to the equator, they are called parallels. The distance of any of these lines from the equator is called its latitude. The lines are therefore termed *Parallels of Latitude*.

Of course every place on any one of these lines is at the same distance from the equator as the line itself, for it is a point on the line. The latitude of a place is the latitude of the parallel on which it stands. The distance from the equator of every parallel is marked on the margin of a map. Any number of parallels may be drawn on a map at any distance from one another. If a map be large, a good many may be drawn; on a small map only a few can be drawn. In Fig. 9 a parallel is drawn for every 10°, and on the margin are the figures 10°, 20°, 30°, and so on. Places on lines with these low figures are said to be in "low latitudes," *i.e.* not very far from the equator. The figures may go up to near 90°, *i.e.* the North and South Poles

NORTH-WEST FRONTIER PROVINCE AND KASHMIR



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and this is the highest latitude any place can have. Places on lines marked with the higher figures are said to be in "high latitudes." The equator itself is marked 0° or zero, for if a place be *on* the equator it cannot be at any distance from it. In other words it has no latitude.

In the physical map of India, Map 6, the parallels of latitude are marked at every 4°. In the map of the British Isles, which is on a larger scale, they are marked at every 2°.

Day and night are caused by the rotation of the earth on its axis, opposite to the sun. Twice in the year, as we shall see, the days and nights are equal in length all over the world, the day lasting 12 hours and the night 12 hours. Fig. 10 shows the earth as it is lit up by the sun at these times, called *equinoxes*, or equal nights.

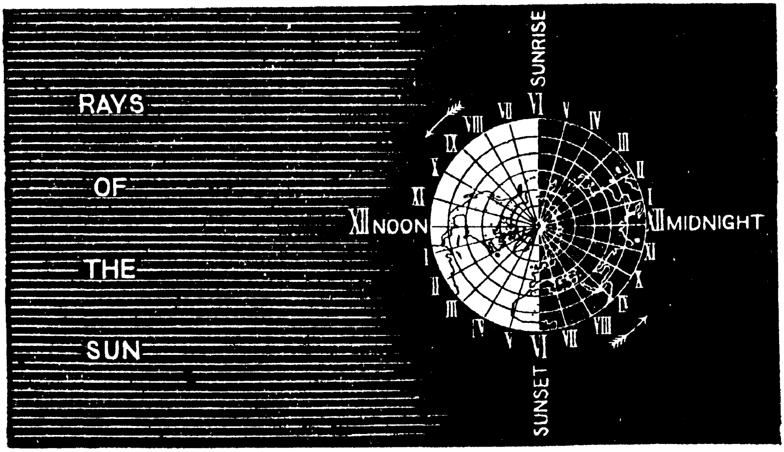

FIG. 10.

In this Figure, the earth is rotating from west to east as shown by the direction of the arrows. The North Pole is opposite to you. You are looking down upon it. The South Pole you cannot see. It is on the other side of the globe. The equator is the line all round the edge of the circle, opposite to the rays of the sun. The east is the point marked "sunrise," and the west is the point marked "sunset."

You see how the solar rays light up one half of the earth at a time. The line dividing the light from the darkness we may call the sunrise and sunset line. It is sunrise at the same moment for all the places along this line, from the North Pole to the South Pole. As the earth rotates, this line of places spins eastwards, another line of places taking its position on the sunrise line. On it goes, till in six hours it comes to the point marked 12 noon. Here it is called the meridian or mid-day line, the Latin word for mid-day being *meridies.* It is noon at the same time for all the places on this line, the sun being right overhead. As the globe spins on, each of the other lines, with the places on it, comes opposite to the sun, and becomes, in its turn, the meridian. All lines are therefore called meridians, which are drawn from the North Pole to the South Pole. They are all "great circles" going right round the earth. They meet at the poles and then get wider and wider apart, being widest apart at the equator. Each of them measures about 25,000 miles, and the length of a degree on any one of them is about 69 miles.

Longitude.—The latitude alone of a place does not show its exact position on the face of the earth. If, for example, we were told that the latitude of a place was 10° N., we might, no doubt, find it by looking along that line across a map till we came to it. To save us this trouble, and to show us exactly on what point of a parallel a place is, we make use of the meridians. The distance of a place east or west of a fixed meridian is termed its longitude, and the meridians are termed *meridians of longitude.*

All British people take the meridian which passes through Greenwich, a suburb of London, as their prime or first meridian. Here is the great national observatory from which the movements of the sun, the moon, and the stars are watched, and the standard time taken for all the watches and clocks throughout the British Isles. Distance east of the Greenwich meridian up to 180° is east longitude, extending half round the globe. Distance in the other direction, to the west, is west longitude, extending round the other half of the globe. Every place through which any meridian passes is at the same distance, east or west as the meridian itself is from the prime meridian. Just as the latitude of any place on the equator is zero, so the longitude of every place on the meridian of Greenwich is also zero. It has no longitude.

Just as any number of parallels of latitude may be drawn, so any number of meridians may be drawn on a map, as may be seen by looking at the maps in this book. In Fig. 11 they are marked at intervals of 10°, where they cross the equator. In an ordinary map the figures showing longitude will be found in the margins at the top and bottom of the map.

The parallels and meridians divide a map into little compartments. These are enough to show us *about* where a place is. For example, Calcutta is in 22° 34′ N. latitude, and in 88° 22′ E. longitude. Look at the top margin of the map of India, Map 6, for the figure 88, and at the margin on either side for the figure 20. Where these lines cross, there is a little compartment, and in it ou will find Calcutta.

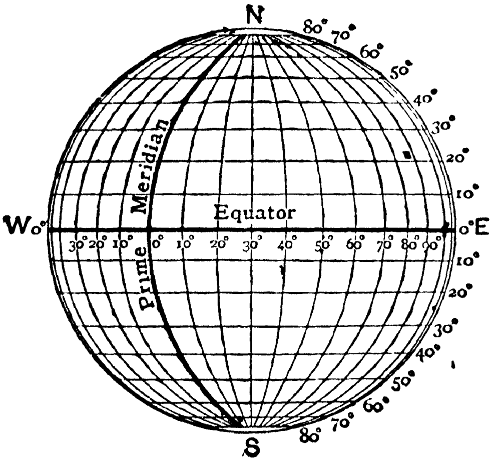

Fig. 11.

In Fig. 11 the black dot just above parallel 20° shows about where Calcutta is.

There are no actual lines like the equator and parallels and meridians on the earth itself. They are only drawn on maps and globes.

The earth is our great timekeeper. This may be seen in Fig. 10. If we divide the circle of the equator, *i.e.*, 360°, into 24 equal parts, each part will contain 15°. In the Figure there are 24 meridians, corresponding to the 24 hours of the day and night, the time it takes for the earth to make a complete rotation. It takes any point on the earth one hour to cross from one of these meridians to another, a distance of 15°. Therefore it moves over 1° in $\frac{1}{15}$ of one hour or 60 minutes, that is to say, it moves over 1° in 4 minutes.

As the earth spins round, each of these 24 meridians comes opposite to the sun in turn, one hour before the meridian behind it. When the sun is on the meridian of Greenwich at mid-day, it is midnight on the meridian of the Fiji Islands (see Map 5). Twelve hours have passed since the sun was on this meridian, which is 180° away. Any two places which are 15° apart differ by one hour in their time. As the earth is spinning eastwards, places to the east see the sun sooner than places to the west behind them at the rate of 4 minutes (of time) to 1° (of longitude). Time is later to the east of any given place, and earlier to the west.

All places on the same meridian have the same time, whatever their latitude may be. When, *e.g.*, it is noon at Madras, it is also noon at Cawnpore, far to the north, both places having very nearly the same longitude, about 80°. For the same reason, when it is 9 A.M. at Bombay, 72° 54′ E., it is also about 9 A.M. at Rawal Pindi, far to the north, in the Punjab, in 73° 7′ E., the difference being only 13′ (of longitude).

But the time is never the same for any two places on the same parallel of latitude. When it is 9 A.M. at Bombay, *e.g.*, it is about 10 A.M. at Calcutta, which is about 15° to the east, and about 9.30 A.M. at Madras, which is about 7½° east. Madras, Bangalore, and Mangalore are in very nearly the same latitude, being about 13° north of the equator. But Bangalore is about 2° east of Mangalore, and is therefore about 8 minutes later in time, while Madras, which is about 2° east of Bangalore, is about 8 minutes later than the latter.

4. THE RISING AND THE SETTING SUN.

On the 21st of March the sun rises at a point on the horizon which we call due east. That day there is sunlight for just 12 hours and darkness for just 12 hours all over the world, from the North Pole to the South Pole. The day and the night are equal in length, and this is therefore known as the *vernal* (or spring) *equi-nox* (*i.e.* equal night).

The next morning, in the northern hemisphere, the sun rises at a point a little more to the north, and for the next three months it keeps on rising a little more northwards every day till the 21st of June, when it seems to stop. In the northern hemisphere this is summer, and the 21st of June is, in this hemisphere, the longest day in the year. In London, *e.g.*, the sun rises that day at 3.44 A.M. and sets at 8.18 P.M., so that the daylight lasts for 16½ hours. Farther northwards the day gets longer and longer, and at the North Pole there is one long day and no night.

The length of the longest day in the year, *i.e.* the longest period of sunlight in the northern or southern hemisphere, is 12 *hours* at the equator, 12½ *hours* at latitude 10°, about 14 *hours* at latitude 30°, 18½ *hours* at latitude 60°, 65 *days* at latitude 70°, 161 *days* at latitude 80°, and 186 *days* at latitude 90°, *i.e.* at the North or South Pole.

As the sun *stops* rising northwards on the 21st of June, this date is called the *Summer Solstice*, *sol* meaning the sun and *stice* being derived from a Latin word meaning "stand still." The next morning the sun, instead of rising northward as before, seems to *turn* southwards and to rise at a point on the horizon a little more to the south. If one looks across this point on the horizon into the sky beyond, into what is called the star-dome, one sees opposite to it a constellation or group of stars which is called Cancer (or the Crab). The point on the horizon is called the *Tropic of Cancer*, the word *tropic* meaning "turning-point."

On the 22nd of September, three months later, the sun rises again at the point at which it rose on March 21, due east. This is autumn in the northern hemisphere. The day and the night are again exactly equal in length all over the world, and so this is called the *Autumnal Equinox*.

For the next three months the sun rises a little more to the south every day till the 21st of December, when it stops again. This is the shortest day in the year in the northern hemisphere.

In London the sun rises at 8.6 A.M. and sets at 3.51 P.M., giving only about eight hours of daylight. The day gets still shorter farther and farther northwards, and at the North Pole there is no day at all, but six months of night.

As it is now winter in the northern hemisphere, this date is called the *Winter Solstice.* The next morning, the sun seems to turn northwards once more, and rises a little more to the north. Opposite the point on the horizon where the sun turned northward, there is, in the sky beyond, the constellation called Capricorn (or the Horned Goat). The point on the horizon is called the *Tropic of Capricorn.*

In this way the sun seems to travel northwards and southwards between the Tropics. It never rises to the north of the Tropic of Cancer nor to the south of the Tropic of Capricorn.

The apparent daily rising of the sun at a more northerly point along the horizon for six months in the year, and its rising at a more southerly point for the next six months, is really due to the revolving earth, which, for six months, turns the northern half of its axis towards the sun as it moves round it, and then turns the southern half of the axis towards the sun for the next six months, the northern half being then turned away from the sun. This we shall see in the next lesson.

5. REVOLUTION OF THE EARTH ROUND THE SUN.

THE SEASONS.

THE spinning earth moves onward as it spins. It revolves, or goes round and round the sun, at an immense distance from it, and while doing so, rotates on its own axis 365¼ times. Each rotation we call a day. We say that there are 365 days in a year. The four ¼ days make up one full day in our reckoning of passing time, so that every fourth year we add one day on to February. That year, we say, has 366 days.

The imaginary line in which the earth moves round the sun is called its *Orbit.* This line is very nearly, but not quite, a circle. It is an *Ellipse,* a curve which is longer one way than the other. If the orbit were a perfect circle, the earth would always keep at the same distance from the sun. But it is known that at one point of its orbit the earth is about 91½ millions of miles from the sun. It is then said to be in Peri-helion,[1] or "near the sun." At another point in its orbit the earth is about 94½ millions of miles from the sun. It is then said to be in Ap-helion,[1] or "away from the sun." Its mean distance is therefore $(94\frac{1}{2}+91\frac{1}{2})\div 2=93$ millions of miles.

The *Plane of the Orbit* is the space bounded by the orbit. In Fig. 12 it is the space within the dotted line. If you can think of a very thin sheet of paper stretching across space and passing through the centre of the earth and the centre of the sun and bounded by the orbit, that would show where the plane of the orbit is. But the thinnest paper has some thickness, while a true mathematical plane has length and breadth but no thickness at all.

As the earth moves round the sun, its axis is not perpendicular to the plane of its orbit. *It is inclined to the plane of the orbit at an angle of* 66½°. *This is the cause of the seasons.*

If the axis of the earth were perpendicular or at right angles to the plane of the orbit, as it always is to the equator, then the equator and the plane would be on one straight line as in Fig. 13. The rays of the sun would light up and heat the same parts of the earth in the same way all through the year. The direct rays of the sun would always fall on the equator. There would be no change of seasons. The sun would always rise at the same point on the horizon, due east, and always set at the same point, due west. The days and nights would be equal in length everywhere.

But the earth does not revolve in this position. Fig. 12 shows the revolving earth at twelve points in its orbit for the twelve months in the year. At the summer solstice, on the 21st of June, the upper half of the axis is inclined directly towards the sun; the North Pole with the circle around it—the Arctic

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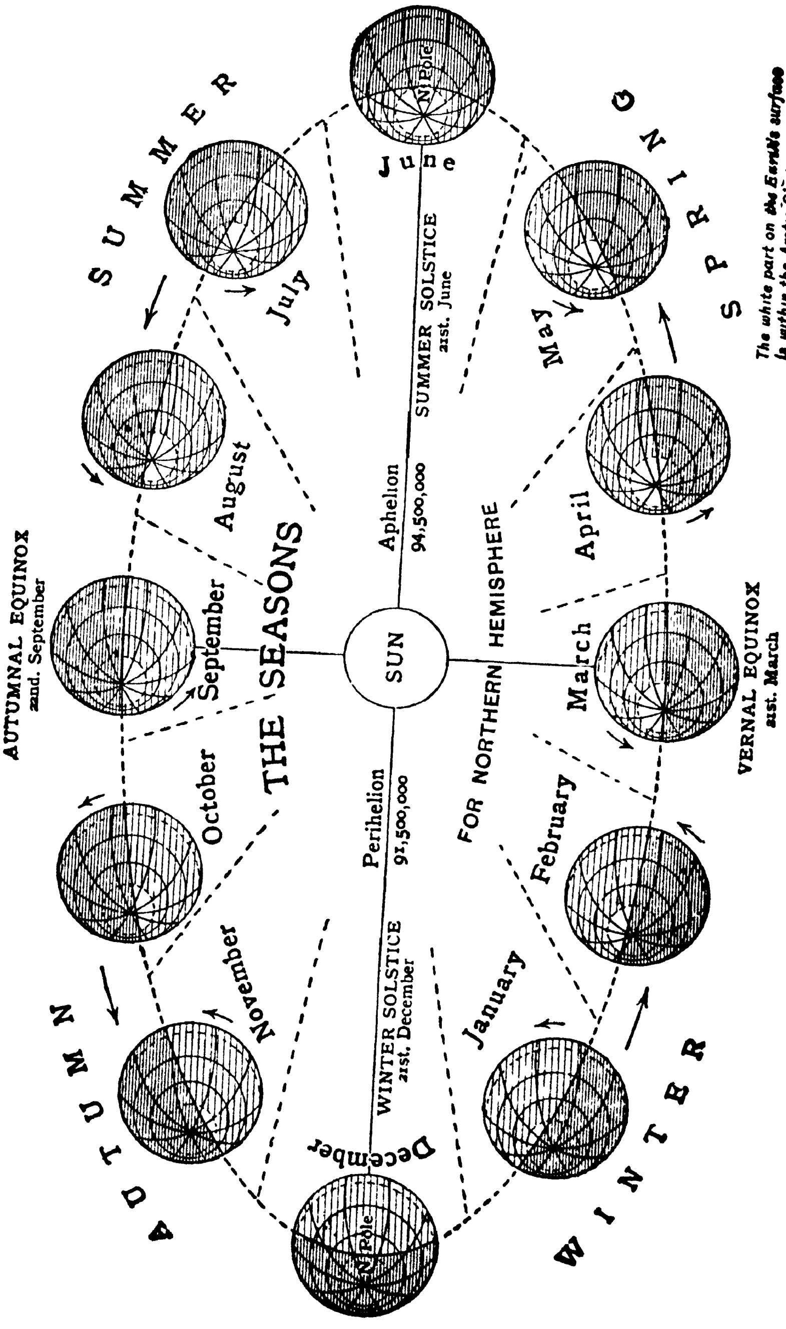
Greek *peri,* near; *apo,* from; *helios,* the sun.



The white part on the Earth's surface is within the Arctic Circle.

FIG. 12.—THE SEASONS.

Circle—is in the sunlight. Six months later at the opposite end of the orbit, *i.e.* at the winter solstice, on the 21st of December, the upper half of the axis is inclined away from the

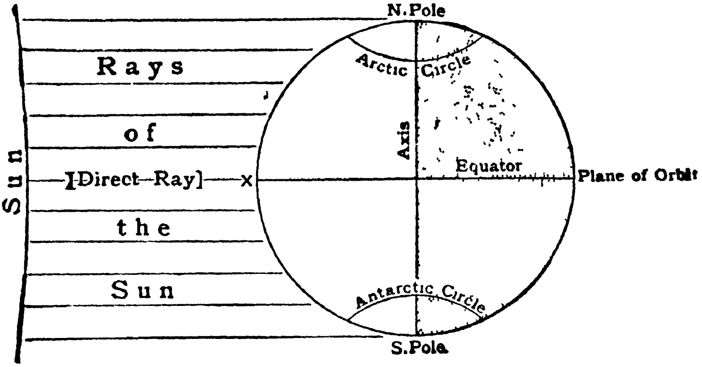


Fig 13

sun, the North Pole with the Arctic Circle is in the dark. At two other points in the orbit, midway between the summer and the winter solstice, just half of the earth and the Arctic and Antarctic Circles are in the light. These are the two equinoxes.

Now look at Fig. 14, which shows more clearly and fully how

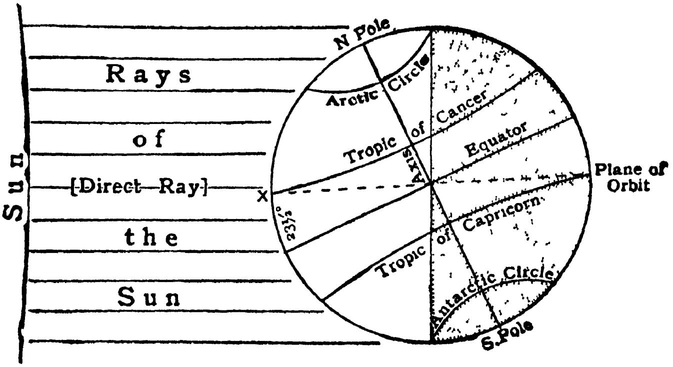


Fig. 14.

the rays of the sun light up the earth at the summer solstice. As we saw in the last lesson, this is the most northerly point on the horizon at which the sun rises.

The earth is, you see, at that point of its orbit which it reaches on the 21st of June, when the northern half of the axis inclines most towards the sun. This is the longest day in the year in the northern hemisphere. The direct rays of the sun do not fall on the equator, but on a point 23½° north of the equator. This point is the Tropic of Cancer. We draw an imaginary line, a parallel of latitude, across the surface of the globe at this point, and the line, as well as the point, is known as the Tropic of Cancer. This line of points, and not the equator, is the line of most sun-heat and sun-light at this time of the year in the northern hemisphere; for the equator is now, as you see in the Figure, 23½° south of the direct ray. It is summer, the brightest and hottest time of the year. The solar rays light up all that part of the earth lying around the North Pole within the Arctic Circle. But it is now the coldest and darkest time of the year for the southern hemisphere, especially at the South Pole in the Antarctic Circle, which is shaded dark in the Figure because the sun's rays do not reach it at all.

Fig. 15 shows the earth at the point of its orbit which

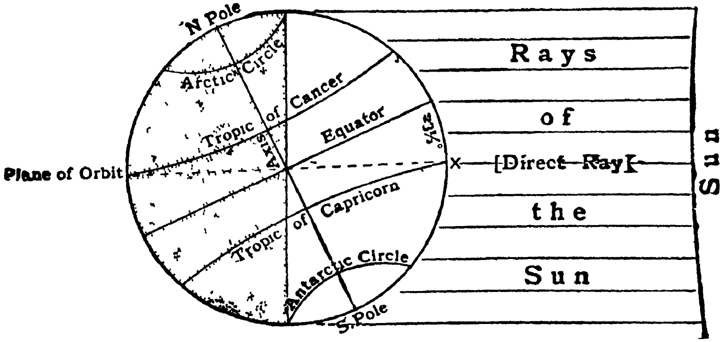


FIG. 15.

it reaches on the 21st of December, the winter solstice. This is the shortest day in the year in the northern hemisphere, when it is midwinter. As we saw in the last lesson, the sun rises, this day, at the most southerly point on the horizon that it ever reaches. The direct rays of the sun now fall on a point 23½° *south* of the equator. This point is the Tropic of Capricorn. Here again we draw a parallel of latitude across the surface of the globe from this point, and the line, as well as the point, is known as the Tropic of Capricorn. This line and not the equator is the line of most of the sun-light and sun-heat in the southern hemisphere at this time of the year, for the equator is now 23½° north of the direct ray. It is summer in the southern hemisphere. The Antarctic Circle is now in the light, while the Arctic Circle is in the dark. This is because the southern half of the axis now inclines towards the sun while the northern half points away from it.

Always when it is winter in the northern hemisphere, it is summer in the southern, and while it is winter in the southern hemisphere, it is summer in the northern.

At the two equinoxes (see Fig. 12) the earth is in such a position that the axis is not inclined towards the sun nor away from it, that is to say, the northern and the southern hemispheres have the same inclination towards the sun. The sunlight now covers the whole face of exactly one half of the earth from pole to pole. The equator is now the line of greatest heat and light. The day is exactly equal to the night, *i.e.* twelve hours long, all over the world, and this is why these points are called equinoxes.

Thus the northern limit of the direct rays is the Tropic of Cancer, and the southern limit is the Tropic of Capricorn. These are the two points on the horizon which, as we saw in the last lesson, mark the farthest points, north and south, at which the sun seems to rise. Every point between these two limits gets the direct rays of the sun sometime or other in the year. No point to the north of the Tropic of Cancer ever gets the direct rays, nor does any point to the south of the Tropic of Capricorn ever get them. *The sun-heat and sun-light line is always changing*, and is always along some parallel of latitude between the two Tropics.

6. ZONES OF SUN-LIGHT AND SUN-HEAT.

SOME of the solar rays fall directly down on a part of the earth's surface right opposite to them, where the sun is directly overhead at noon. These are called *direct rays.* But the surface of the earth is everywhere a curve, which slopes or slants away in every direction from any point upon it. Rays which fall on a slant or slope are called *oblique* or *slanting rays* to distinguish them from the direct rays. In Fig. 13 the direct ray is falling on the equator. The rays to the north and south are slanting rays. They give less and less light and heat as they fall on the curved surface, sloping away on all sides from the point where the direct ray reaches the surface.

The whole surface of the earth may be divided into broad spaces called *zones*, which mark the degrees of light and heat received from the rays of the sun. Fig. 16 on p. 23 shows these zones.

The circumference of the earth measures, as we have seen, about 25,000 miles. The distance over the surface of the globe from pole to pole is therefore about 12,500 miles, and the distance from the equator to either pole is about 6250, or in round numbers, about 6000 miles.

At the equator, in the middle, there is the *Torrid* or Hot zone, about 3000 miles broad, lying between the Tropic of Cancer and the Tropic of Capricorn. It is clearly marked out by the sun, for the sun always rises at some point on the horizon within these Tropics, and never beyond them. It extends for 23½° north and 23½° south of the equator. The northern half is the North Torrid zone, about 1500 miles broad, and the southern half is the South Torrid, also about 1500 miles broad.

Far to the north and far to the south, around the two poles, lie *Frigid* or cold zones, each about 1500 miles broad. The North Frigid is bounded by the Arctic Circle, which is 23½° south of the North Pole, and the South Frigid is bounded by the Antarctic Circle, 23½° north of the South Pole. These zones are also marked out by the solar rays. For one half of the year, the sun never sets, but may always be seen, low down on the horizon, from the North Pole, where this period is one long day, lasting for six months, without night. At the South Pole, at the same time, the sun never rises at all, and there is one long night (see Fig. 14). For the other half of the year it is night for six months at the North Pole, and day at the South Pole (see Fig. 15).

Between the Frigid zones round the poles in the far north and the far south, and the Torrid zone at the equator in the middle lie two great belts, one about 3000 miles broad in the northern hemisphere, and another, also about 3000 miles broad, in the southern hemisphere. These are called the *Temperate* zones. Each of them may be divided into a *Warm Temperate* zone, about 1500 miles broad, lying next to the Torrid zone, and a *Cool Temperate* zone, about 1500 miles broad, lying next to the Frigid zone.

The greatest light and heat from the rays of the sun are therefore seen and felt in the Torrid zone. The heat of the rays is not so fierce, nor is there the same blinding blaze of light in the Warm Temperate zones. Both heat and light grow less to the north and to the south in the Cool Temperate zones, while, in the freezing Frigid zones, the light is feeble and the heat is not enough to melt the ice and the snow which cover the face of the earth around the poles.

The change in temperature is, however, very gradual. There is no sharp or sudden increase of light or heat as we pass across the imaginary line which divides one zone from another. And, as we shall see, the heat at the surface of the earth depends very much on what that surface itself is—whether it is land or sea, a high mountain or a low-lying plain. And we must remember that the line of the greatest heat of the rays along the earth's surface is not always the equator, but that it changes as the earth moves in its orbit round the sun; this heat-line being sometimes north and sometimes south of the equator These zones of light and heat are therefore not zones of climate.

7. THE SOLAR SYSTEM.

GRAVITY.

THE earth is a great spinning ball or globe that revolves in space around the central sun. If we look upwards at night into

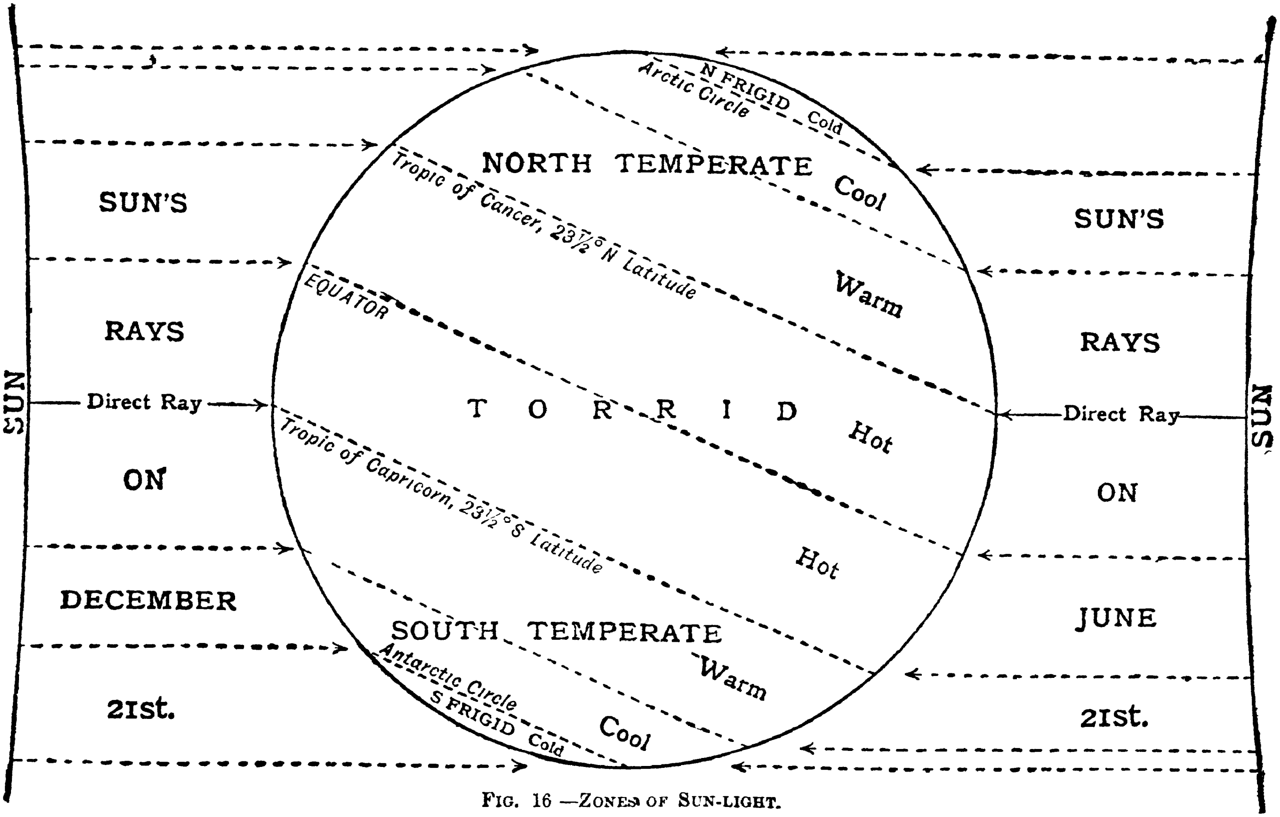


FIG. 16 —ZONES OF SUN-LIGHT.

this open space we call the sky, we see the moon and the stars.

The *moon*, like the earth, is a spinning globe which rotates on its axis and revolves round the earth once a month. Like the earth it is a dark body. It has no light of its own, and only looks bright to us because it reflects the light of the sun which shines upon it. It revolves round and round the earth at a distance from it of about 240,000 miles. It is much smaller than the earth, having only one fiftieth of its volume. The sun looks to us as if it were of the same size as the moon. It is, however, enormously larger, and only looks small because of its immense distance. As the moon keeps close to the earth and cannot get away from it and is so much smaller, it seems to belong to the earth, and is called its *satellite* or attendant. The moon and its changes will be more fully described later on in this book.

In the sky we see, at night, points of twinkling light, which we call stars. About 6000 stars may be seen in the *whole* sky with the naked eye. All but a very few are called *Fixed stars*, because each of them is always at the same distance from the others, although the whole star-dome, *i.e.* the sky with the stars in it, seems to be moving round slowly overhead. Like the sun and moon, most of the stars rise on the horizon, move across the sky, and set or sink out of sight on the opposite horizon. They do not really move round the earth any more than the sun does. They seem to us to do so because the earth itself is moving round, or rotating on its axis. Some of these stars seem to be arranged in groups or constellations, as seen from the earth, and the ancients gave them names. Two of them they called Cancer and Capricorn, because they thought that the first looked like a crab and the second like a goat with horns.

The fixed stars are countless in number. Although only about 6000 can be seen with man's feeble eyes, a good telescope brings into view some 20 millions more, and with the aid of the most powerful telescopes that have been made, 500 millions of stars may be seen on photographs of the sky. Fig. 17 shows a spot on the sky on which nothing can be seen by the naked eye, not even one star. But, through a large telescope, thousands of stars may be seen at that spot. They look close to one another in the sky just as they do in the Figure, but immense distances separate them. The fixed stars are really enormous blazing suns, some of them hundreds of times larger than our sun, all shining by their own light. They are at immeasurable distances from us and from one another, and that is why they look to us tiny points of light. The nearest fixed star is more than 25 millions of millions of miles away from us, and others are at such vast distances that we cannot conceive of those distances, much less measure them. They are all moving rapidly through space, but where they are going we do not know.

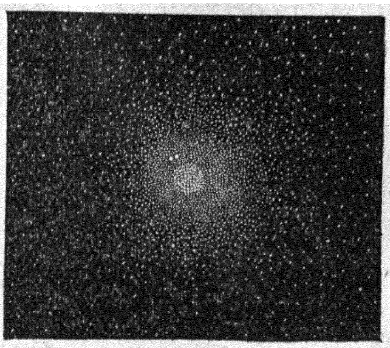


FIG. 17.

A few stars do not twinkle, but shine with a clear steady light like the moon. This is because they are much nearer to us than the rest. They do not keep at the same distance always from one another, but go on changing their places in the sky night after night, and seem to be wandering about among the other stars. The ancients called them *Planets* or Wanderers. They are dark bodies like the earth and moon, and do not shine by their own light, for they have none. They look bright to us because the sun shines upon them, as he does upon the earth and moon, and they reflect his light. They are all spinning balls or globes like the earth; each of them rotates on its axis and revolves round the sun in its own orbit. Five of these planets were known to the ancients, who had no telescopes, and these five may be seen with the naked eye. They are Mercury, Venus, Mars, Jupiter, and Saturn. By the aid of the telescope, two other great planets have been discovered, and more than 600 very small ones. All but two of the large planets have moons revolving round them. The earth is itself a planet, and would look like a planet from a great distance, shining with a clear steady light, and wandering about among the stars.

As the earth and all these planets revolve round the sun, which is immensely larger than all of them put together, they seem to belong to him. The sun (*sol* in Latin) and his planets form what is called the *Solar system.*

The solar system includes eight large planets and 635 small planets. The large planets, in the order of distance from the sun, are ·

1. Mercury.
2. Venus.
3. Earth.
4. Mars.
5. Jupiter.
6. Saturn.
7. Uranus.
8. Neptune.

Fig. 18 shows the comparative sizes of the eight planets. Four of them, including the earth, are much smaller than the rest. *Jupiter* is always covered with thick clouds, as shown in the Figure, so that the body of the planet itself cannot be seen. It is the largest of the planets, its diameter being about twelve times that of the earth. It has eight moons revolving round it, and it takes twelve of our years to go round the sun once. *Saturn* has ten large moons and is surrounded by "rings" which seem to be made up of countless tiny moons. It goes round the sun in about thirty years. *Uranus* and *Neptune* are at enormous distances from the sun. The former is nearly 2000 millions of miles away, and goes round in about eighty years, while the latter, the outermost planet, so far as is known, is nearly 3000 millions of

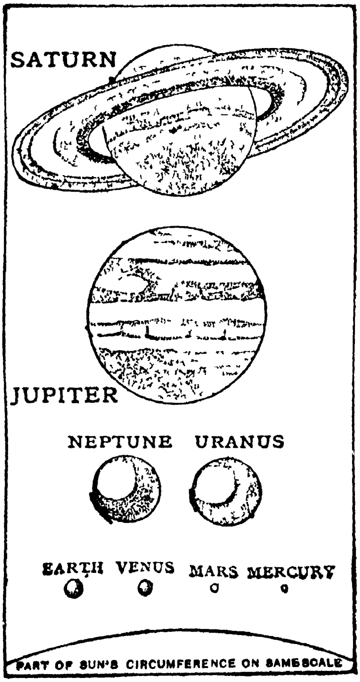


Fig. 18.

miles off, and completes its long journey round the sun in about 165 of our years.

Mercury and *Venus* are called Inner planets because, as may be seen in Fig. 19, they are closer to the sun than the earth. All the rest are Outer planets, their orbits being outside that of the earth. Of all the planets *Mars* is most like the earth. On it there are clouds, land, water, mists, and air. On its surface, as seen through the telescope, there is a network of canals full of water, and this seems to prove that there must be inhabitants of some kind on Mars who made those canals.

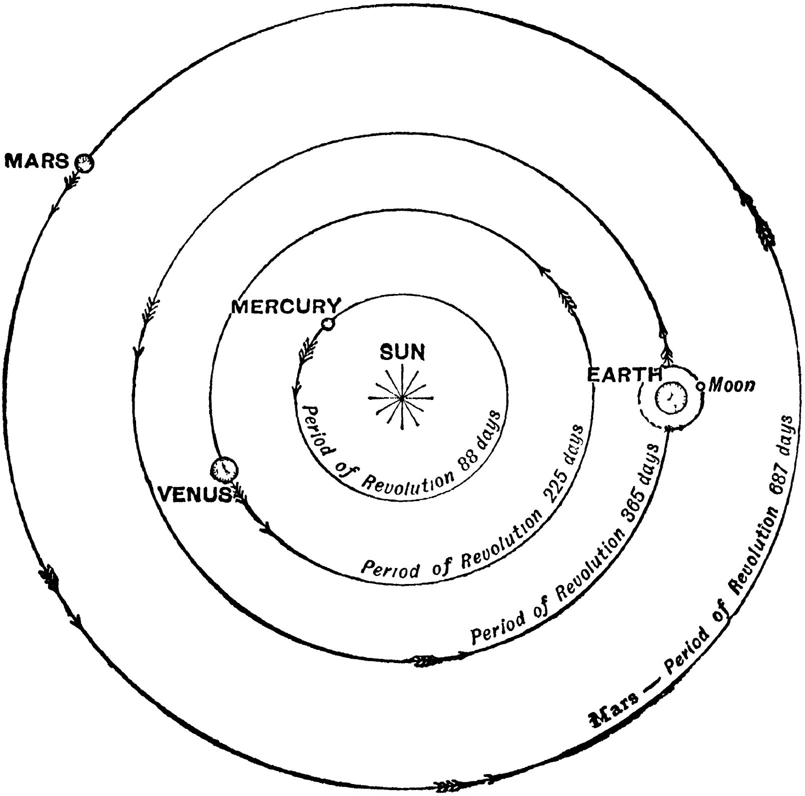

MARS
MERCURY
SUN
EARTH
Moon
VENUS
Period of Revolution 88 days
Period of Revolution 225 days
Period of Revolution 365 days
Mars — Period of Revolution 687 days

FIG. 19.

The *Sun* is one of the fixed stars, the star nearest to us. It is a great globe of blazing fire, of white-hot gas, 500 times as large as all the planets put together. The diameter of the earth is under 8000 miles, the diameter of the sun is over 800,000 miles. It would take 1½ millions of earths to make a globe as large as the sun. Like the earth, the moon, and the planets, the sun rotates on its own axis and does so in 27½ of our days. It radiates light and heat in all directions. The heat and the light which the earth gets from the sun seem to us to be very great. Yet if the total amount of heat and light which the sun is ceaselessly darting forth be divided into 2139 million parts, the earth receives but *one* of these parts.

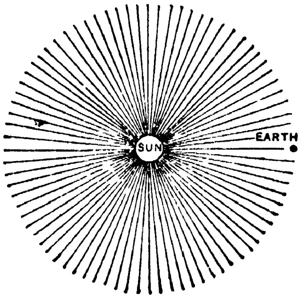


FIG. 20.

So far as we know, the sun, the earth with its moon, and the planets with their moons, were all, at some very far off time in the past, *one* great body of blazing gases, rotating at enormous speed. One after another, great masses of gas were whirled off into space and each became in time a world, spinning round and round in the same direction as the great ball of gas it had left, and revolving in its own orbit round the parent sun, of which it was at first a part. It has been proved that the sun, the moon, and the planets all contain the same substances or elements, *e.g.* iron, copper, and the other metals and minerals found in the earth, together with carbon and the gases oxygen, hydrogen, and nitrogen, which make up the air on the earth. But in the sun, which is intensely hotter than the other members of the solar system, the metals are gases, so that instead of solid copper, iron, or carbon, there is in the sun iron gas and copper gas and so on. It is one of the great laws of nature that *heat expands a body*, and that as heat leaves it and *as it becomes cold it contracts* and becomes liquid and then solid. The planets in their turns, one after another, flung off smaller masses of gas, which kept rotating and revolving round them as their moons.

The smaller bodies radiated off their heat into space and became cooler than the larger ones, just as a small red-hot ball of iron cools much faster than a very large ball. As they cooled they contracted, and their outer parts became solid or liquid.

At first they shone by their own light, as the sun does, but as they lost their heat, they became dark bodies, just as an iron ball does. When white-hot, it is so bright that one can scarcely look at it; when red-hot it is not so bright but still lights up a dark room, and at last, as it cools, it becomes a dark body.

A whirling mass of gas, like what the sun once was, is called a *nebula* Far off, in the depths of space, the telescope shows us vast whirling nebulæ. They, at some distant future, will, no doubt, form new suns, which in their turn will fling off new worlds. Fig. 21 is a photograph of one of these great whirling nebulæ countless millions of miles away.

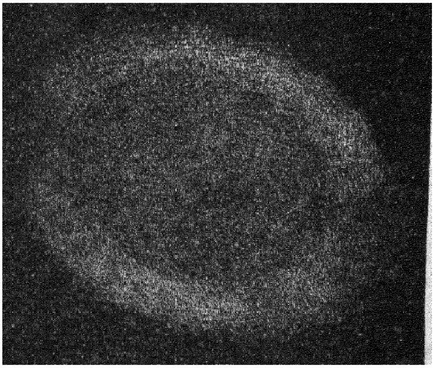


FIG. 21.

But although the planets were whirled off from the sun with enormous velocity, they could not leave it altogether and rush off into space The sun kept up its pull upon them from a great distance, and would not let them go The earth and the other planets too kept up their pull upon their moons, and would not let them go. This *pull* of the sun upon the planets and that of the planets upon their moons is known as the *Attraction of Gravity* It is one of the great laws of nature and was found out for us by Isaac Newton, the great English astronomer, a little more than 200 years ago. Newton showed that this force acts, not only between the sun and the planets, but everywhere, between all things. All things attract one another. Large things attract small things, and small things attract large things. But the larger a body is, the stronger its pull is, and the closer two bodies are, the stronger is the pull of each upon the other. Solids, liquids, and gases all attract one another. The sun, a great ball of gas, attracts the solid earth; and the moon, as we shall see, attracts the liquid oceans on the earth. The earth, too, attracts the air so that it cannot leave the earth, but keeps close to it.

Attraction acts at any distance, even over a hundred millions of miles, but with much greater force at shorter distances. Halving the distance between two bodies increases the attraction *fourfold*, and reducing it to one-third increases it *ninefold*, *i.e.* it increases *inversely as the square of the distance* [$2^2 = 4$, $3^2 = 9$, and so on]. This is why the moon is attracted to the earth and does not rush away to the sun. The sun attracts it, too, and is an immensely larger body than the earth, but the earth is much closer to the moon than the sun is, and therefore its attraction on the moon overcomes that of the sun.

This irresistible force of attraction acts everywhere, even among the most distant stars. The whole solar system, the sun with his planets, is rushing along at the rate of four miles a second, and therefore must be attracted by some larger body somewhere. All the fixed stars, too, are rushing through space. They are all attracted by *something, somewhere.* Where they came from, we do not know. Where they are going, we do not know. That they *are* moving, we *do* know.

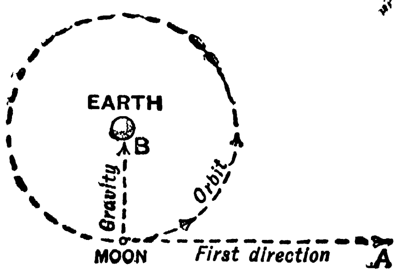


FIG. 22.

Another law of nature discovered by Newton is this. Any body, once set moving by any force, will move on in the same straight line at the same rate for ever, unless it be acted on by some other force. When the moon was whirled off by the earth, it rushed away and would have been lost to the earth, if it had not been for the force of gravity. Two forces were acting upon it, as shown in Fig. 22. The first was the force which whirled it off, when the earth, as a great ball of gas, extended up to the present orbit of the moon. That force alone would keep it moving in a straight line away from the earth towards A. The other force. gravity, would pull it in a straight line to the earth towards B. The moon therefore moved *between* the two. The same two laws act upon the earth and the other planets, and keep them revolving in their orbits round the sun.

8. THE MOON.

The Months.

We have seen that our year is made for us by the revolution of the earth round the sun in 365 days, and that one day is made by the rotation of the earth on its axis once in 24 hours. The moon makes our months by its revolution round the earth.

It takes the moon about 27 days to go round the earth, and if the earth stood still, this time would make a lunar month. But the earth is moving rapidly along in its orbit round the sun, so that to reach the same point opposite the sun, from which it started, the moon has to travel a little further every time, and the period from one new moon to another is about 29½ days. This is a *lunar* month. But 12 times 29½ make 354 days only. To complete the *civil* or ordinary months, half a day is added to some months and a day and a half to others, so as to make up the full number of 365 days.

Like the earth and the planets, the moon spins round on its axis and takes just 29½ days to do so, *i.e.* exactly the same time that it takes to go round the earth. The consequence is that it always turns the same face towards us. The other half no one has ever seen. It may not seem easy to understand how the moon can be forever spinning round and yet never show one half of its face to us. To make this clear, walk round a boy in the middle of the room, always keeping your face towards him, the boy turning round too and looking at you all the time. When you get half round, you will see that any object, *e.g.* a chair, which was behind your back when you started, is now in front of your face. When you get back to your starting-point, you will find that object again behind your back. This shows that you have turned right round, or rotated on your axis once, while walking round the boy. Yet the boy has not seen your back at all. The boy too has turned right round and yet you have not seen his back as he was rotating.

The light of the moon is feeble compared with that of the sun. It would take 600,000 full moons shining all at once to give us the light of the sun. Once the moon was a ball of blazing gas, shining by its own light, when the earth whirled it off into space. Then it became red-hot, and then dark. It long ago lost its light and its heat. There are huge extinct volcanoes on it. The surface of the moon is solid rock. But there are no seas, no rivers, no air on the moon. There are no animals and no plants or vegetables. It is a dead cold world. To us, however, it gives light by night, and it raises the *tides* on the ocean, which are so useful to sailors.

9. THE MOON (*continued*).

PHASES AND ECLIPSES.

THE moon has a new shape every night of the month. We see it as a new moon, a half moon, or full moon, or of some other shape between these. The different shapes of the moon are called its *phases*. How are they caused?

The chief of these phases are shown in Fig. 23.

The moon is itself a dark body. It gets all its light from the sun. The sun, of course, can only light up a half of the moon at a time, namely, the half turned towards it. If we are on the same side of the moon [illegible] the sun is, we shall see the part lit up by the sun, the bright part. If we are on the other dark side, the moon being between us and the sun, we shall see no moon at all, for it is a dark body in the darkness.

In Fig. 23 the sun lies at the top, out of sight; its rays are seen falling on the earth and the moon. In the centre there is the earth. In the outer circle we see the moon as it is lit up by the sun in twelve positions in its orbit round the earth. One full half is always lit up, being opposite to the sun. This is how the moon would look from the sun. It would be always Full Moon.

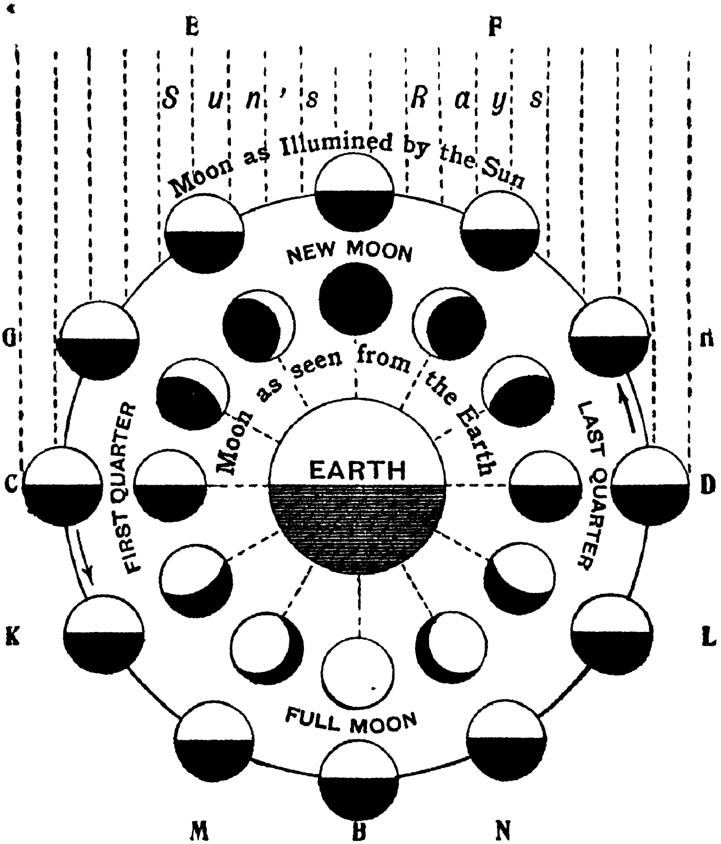


FIG. 23.—PHASES OF THE MOON.

In the inner circle, there is the moon in the same twelve positions, as it looks to us from the earth.

At A, the side of the moon opposite to the sun is lit up. As we, on the earth, are on the other, dark side, the moon being between us and the sun, we cannot [illegible] the lit-up half, in fact we see no moon at all. This is, properly speaking, the *New Moon*.

although people often apply this term to the next phase, when a slight crescent or rounded rim of the moon comes into view. At B we are facing the lit-up half and see all of it. This is *Full Moon.* In this phase, the earth, the sun, and the moon are all in one line, the moon being outside and not in the middle, as it is at New Moon. At C and D the moon is half-way between New and Full Moon. We now see just one half of the lit-up face of the moon, these phases being the first quarter and the last quarter (of the lunar month). At E, F, and at G, H, we see *crescent* moons, being so much as is lit up by the sun, the horns or points being turned different ways as the moon is approaching the New Moon or leaving it. At K, L, and at M, N, the shape of the moon is said to be *gibbous.*[1] The lit-up part is getting larger, between a half and full moon at K, L, and a full and half moon at B, M, N.

From the phase of New Moon, the moon is said to *wax* or increase till it is full, and from Full Moon, it is said to *wane* or decrease till it is New Moon, when it vanishes, the half turned towards the earth being altogether in the dark.

The plane of the moon's orbit is the space bounded by the (imaginary) line along which the moon moves round the earth. This plane is not the same as that of the earth's orbit round the sun. It does not lie on the same level. It is inclined to it at an angle of 5°. The plane is, so to speak, a little tilted up, so that one half of it is a little above the plane of the earth's orbit, and the other half a little below it. How one plane can be inclined to another and cut it may be seen in Fig. 24. These planes are shaded and look as if they had some thickness. The planes we are describing are mere empty space, and they cut each other as these planes do, but at a much smaller angle.

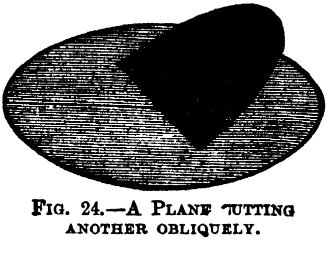


FIG. 24.—A PLANE CUTTING ANOTHER OBLIQUELY.

In Fig. 23, to make the phases very clear, we supposed that the moon moved in the plane of the earth's orbit, *i.e.* the level of the page of the book. But if it did this, every new moon would come between the earth and the sun and shut out the sun from view, *i.e. eclipse* it. And every full moon the earth would come between the moon and the sun and shut out the light of the sun from the moon, *i.e.* there would be an eclipse of the moon. Eclipses do happen, but not once a month.

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[1] Latin *gibous*, a hump or swelling.

At Full Moon the moon is usually just *above* the plane of the earth's orbit, so that the sunlight passes *over* the earth to the moon. At New Moon the moon is generally just *under* this line.

The line of the orbit of the earth (not the plane) cuts the line of the orbit of the moon in two points every month, as the moon passes above the plane and below it. These points are called *nodes*. If the moon happen then to be new or full, *i.e.* in a line with the earth and the sun, we shall have an eclipse of the sun or an eclipse of the moon as in Fig. 25.

Here there is the sun at the bottom of the picture, with its rays shooting upward and lighting the earth and the moon above it. The earth is in the middle and the moon in two positions marked A and B. The plane of the earth's orbit is the level of this page. The moon, too, is on the same level, and the plane of its orbit, shown by the circular dotted line, lies on this level.

At A, the moon being between the sun and the earth shuts off the sun's rays and casts a dark circular shadow on the earth, and the people on that part of the earth, on which the shadow falls, cannot see the sun. This is an *eclipse* of the sun. The shadow is never more than above 150 miles in diameter, and never covers any place more than 7 minutes.

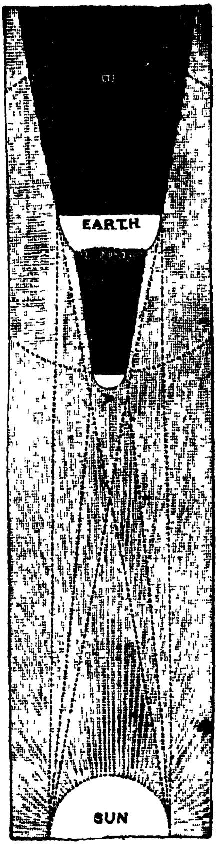


FIG. 25.—ECLIPSES OF THE SUN AND MOON.

At B, the moon is at another point in its orbit on the other side of the earth away from the sun. It is in the shadow of the earth. The circular shadow of the earth creeps over the moon and very soon blots it out altogether. This is an eclipse of the moon. It may be seen at night from the whole side of the earth turned away from the sun. It may last nearly two hours.

10. THE CRUST OF THE EARTH.

Below the soil on the land there is solid rock. Below the bed of the ocean there is also solid rock. This bed of rock is the outer crust of the earth. Fig. 26 shows an imaginary section of the earth from the surface to the centre. On the curved surface of the globe rests the air or atmosphere up to a height of about 200 miles. It is very rare and light high up, but denser and heavier below, where the upper layers press down the lower layers. Then comes the outer crust of rock. How thick it is we do not know exactly. It is *supposed* to be about 10 miles in thickness. It is sometimes called the Lithosphere, or Sphere of Stone (from the Greek *lithos*, a stone). Below it there is the interior or inner part of the earth.

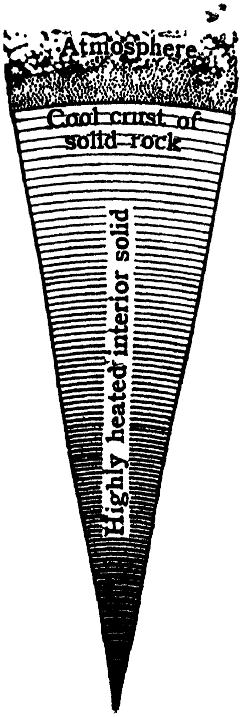


Fig. 26.

The upper layers of the crust of the earth we can see and examine, and chemists and geologists can tell us of what it consists and how it was made. But the interior, which lies far below the outer crust, no one has ever seen or can see. Yet we know two things about it: it is very heavy, and it is intensely hot.

By watching the movements of the moon and the planets which are affected by the gravity of the earth, astronomers can tell with what force the earth attracts them and, therefore, how heavy it is. They have proved that it is about five times as heavy as a globe of water of the same size would be, while most of the rocks which make up the crust of the earth are from two to three times as heavy as water. The earth as a whole is therefore about twice as heavy as rock. It is probably solid, for it seems that the enormous weight of the land, with its mountains, the great oceans, and the rock beneath them, must press it into a solid. Most of the interior probably consists of the heavier metals.

That the interior must be intensely hot, we know from Mines, Wells, Hot Springs, and Volcanoes. *Wells* have been dug to a depth of hundreds of feet, and the deeper the well the warmer the water at the bottom is. In *Mines* some of which are nearly a mile deep, the air at the bottom is very hot. The deeper the mine, the hotter the air. The heat of the rock into which a mine is dug increases at the rate of about one degree of the thermometer for every 50 or 60 feet in depth. If the heat goes on increasing at this rate, the hardest metals would melt at the depth of 30 miles. *Hot Springs* are found in many countries in the world where very hot water rises to the surface, *e.g.* Bath, in England, has been famous since the Romans ruled England, about 2000 years ago, for its hot springs. Some of these springs are called *Geysers* or "gushers." They are always near volcanoes. In Iceland there are over a hundred of them—huge columns of boiling water are thrown up from 100 to 200 feet into the air, with clouds of steam. They occur also in North America and in New Zealand, always near volcanoes. *Volcanoes* are described in another lesson. They are cracks or openings in the land out of which streams of melted rock and gas and steam are hurled upwards with great force into the air, proving that the heat within the earth out of which they rise must be very great.

Chemists have shown that everything in the earth, the air, and the sea is made up of certain *elements* or of mixtures or compounds of them. All animals (ourselves included), vegetables, and minerals are made up of some of these elements. There are, so far as we know at present, about 75 of them, some being gases, some liquids, and some solids. The names of the elements and their chief compounds may be learnt from any book on Chemistry. Some of the more common are the gases Hydrogen, Oxygen, and

Nitrogen, the liquid Mercury, and the solids Iron, Copper, and all the metals; also Carbon, Silicon, and Sulphur. Water (which is a compound of oxygen and hydrogen) is a liquid; if heated, it becomes a gas which we call steam or water vapour; if very cold, it becomes solid ice. If solid iron be heated very much, it becomes liquid, and if heated still further, it becomes a gas. Iron and all the elements are in the sun in the state of gases, and gases they once were in the earth, when it left the sun.

If a large mass of iron be melted in a furnace and then allowed to cool, an outer crust of hard iron slowly forms on the surface and grows gradually thicker, while underneath it the iron is for some time a boiling liquid. The iron cools and becomes solid from the outside inwards. So it was with the earth.

Men of science tell us that the earth, at first a globe of blazing gases, shining like the sun by its own light, gradually cooled, as it radiated its heat into space. At first white hot, it became red hot, and at last a dark body. At the same time it contracted and at length shrank to its present size. Some of the gases became liquids or solids or partly liquid and partly solid. Some of the lighter gases mingled and formed the air, or atmosphere, which still surrounds the earth. Many of the heavier liquids (of the heavier metals) probably sank through the lighter liquids towards the centre of the earth. Water covered the surface of the globe on which a solid outer crust or layer of rock—some of it hard, some of it soft—slowly formed. At first very thin, it gradually grew thicker.

Millions of years passed. Under the solid crust, the boiling, bubbling mass of liquids and gases on which it rested began to cool too, and to contract and shrink in size. Parts of the solid crust then began to sink, as the support on which they had rested gave way here and there. Other parts were pushed upwards through the crust wherever there was softer and thinner rock. In this way, parts of the lands slowly rose up through the water and formed continents with their mountains and islands. Great hollows were formed where the crust sank and into them the waters rushed, forming seas and oceans. This rising and sinking of parts of the outer crust of the earth went on through vast periods of time. What was the sea became land, and what was land became sea over and over again. At length, as the ages rolled on, the form or *build* or *relief* of the land became, more or less, what we see, although even now some of the land is slowly sinking and other parts are slowly rising, but the movement is so slow that we, who are now living, scarcely notice it.

11. THE CRUST OF THE EARTH (*continued*).

Rocks.

Soil.—The upper layer of the crust of the earth we call *soil.* It covers the face of the earth nearly everywhere. In it plants and grasses grow. It is made up of very fine grains of different kinds of stones or rock, mixed with the decaying remains of plants and animals.

Subsoil.—Under the soil there is another layer, more or less thick, of *subsoil.* The roots of big trees reach down into it if the soil be not very deep. In it there are stones of the same sort that there are in the soil above it, but the pieces of stone are larger. If the soil be chalky, the subsoil consists of pieces of chalk. The soil is merely the upper part of the subsoil that has crumbled away and been mixed with the decaying remains of plants and animals. As the soil is washed away by rain or running water, or blown away by wind, the upper part of the subsoil rises to the surface and gradually becomes soil.

Rock.—Under the subsoil there lies *rock* everywhere. The subsoil and the soil above it have been formed by the decay and breaking up of the rock that lies below. If the *rock* be chalk, the *soil* is chalky; if it be limestone, the soil is full of limestone, and so on. We can usually tell from soil what sort of rock lies far below.

In Fig. 27 we see the soil in which grass and shrubs are growing. Below it there is the subsoil, made up of partly decayed rock and small stones. Underneath there are solid rocks. They are in beds or layers which are full of cracks.

through which water finds its way, widening the cracks and loosening the beds of rock.

The word *rock* usually means hard stone. We say "as hard as a rock." But in geography it has a wider meaning. Everything that is a mineral or metal is rock. It may be sand, or clay, or iron, or chalk, or gold, or slate; it may be hard or soft; it may be black like coal, or white like chalk, or of any colour. Mud is rock mixed with water.

If we think of the *matter* out of which rocks are made, we call such as consist of the remains of plants and animals *organic*, for both plants and animals have organs. Chalk, *e.g.*, is organic rock, made out of the shells and bones of once living animals. This can be clearly seen if a little chalk powder be placed under a microscope. The powder is seen to be tiny grains of shells. *Coal* is organic rock, for it is merely the wood of trees hardened into stone. In many parts of England there are hills of chalk.

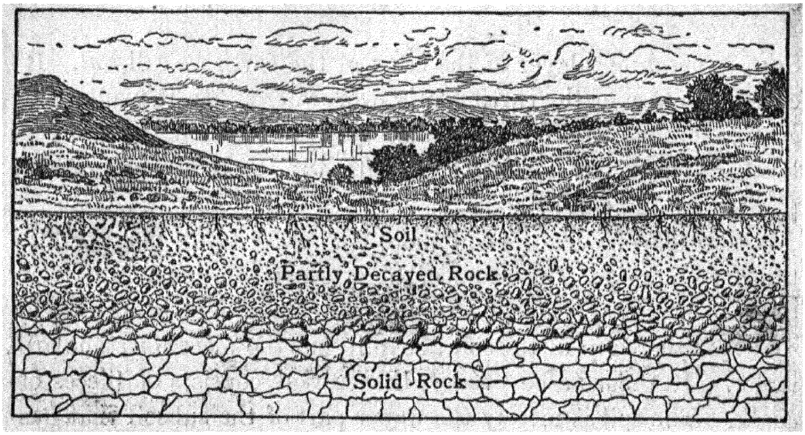


FIG. 27.

But if we consider the *process*, or way in which rocks were formed, we may put them all into two groups, as *stratified* (or sedimentary), which lie in strata or beds or layers, as in Fig. 27, and *unstratified*, which are in huge masses or lumps. Stratified rocks have been formed by the action of water. Unstratified rocks have been formed through the action of heat and cold, and are sometimes called igneous (Latin *ignis*, fire). And some rocks which were at first stratified have been so altered or "metamorphosed" by heat or by great pressure inside the earth, that they no longer look like what they once were. They are called *metamorphic* or altered rocks. *Slate, e.g.*, is metamorphic rock, for it was altered from clay, which is sedimentary; *marble* is metamorphic, for it has been altered from limestone, which is organic as to material and sedimentary as to formation, and *gneiss* is metamorphic, for it has been altered from granite.

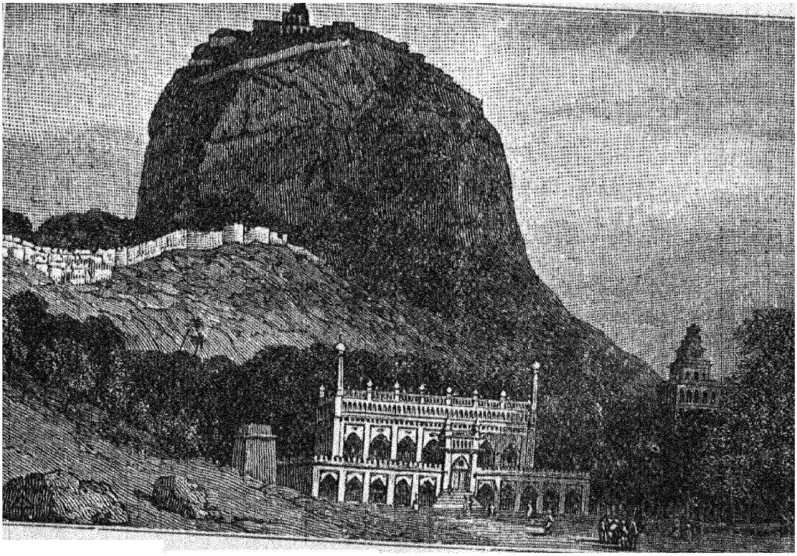


Fig. 28.—Raja Giri, Gingee, South India.

Igneous rocks are the oldest. They formed the crust of the earth as it slowly cooled and became liquid and then solid. The most common of these igneous rocks is *granite*. It lies below all the other kinds of rock, but some of it has been pushed up through them in various places by the earth movements to be described in the next chapter. It is now met with in parts of many mountain chains, *e.g.* the Himalayas. *Gneiss* is a kind of rock which has been metamorphosed into granite which has been melted and cooled again. It is called *granitic*, and is the most common rock in South India, where there are many huge masses of it known as *Droogs* or hill forts, hundreds of feet high. *Raja Giri* in Gingee is one of these. It is 600 feet high.

Sedimentary Rock.—If a little muddy water be put into a glass, the mud will slowly sink to the bottom and lie there. This we call *sediment.* It is also called a *deposit.* We say that it has been *deposited* by the muddy water. In the same way, the gravel, sand, and mud, that thousands of rivers all over the world carry down to the sea, slowly sink through the water to the bottom and lie on the floor of the ocean as sediment. The gravel and sand, being heavier, sink close to the mouth of the river, while the mud, made up of finer earth, is deposited further away in the ocean. The air is full of dust, although we do not always see it, and this dust falls in vast quantities into the ocean, and settles down at the bottom as soft mud called *ooze.* And the ocean is full of countless millions of fishes, many of which live in shells. When they die, their bones and their shells sink to the bottom and lie there. Year after year, age after age, layer is deposited on layer. The upper layers press down the lower layers, and above them there is the enormous weight of the ocean also pressing them down. Slowly they are crushed into solid rock which is called *sedimentary* because it is formed of sediment. It is also called *stratified rock* because it consists of strata or layers. If rock like this was formed from sand, it is called *sandstone.* If it was formed out of clay, it is called *shale* or *slate.* Sandstone is formed near the mouths of rivers, and shale and slate further out, where the mud was deposited. *Slate* is metamorphic, being merely melted and hardened *shale* which is the hardened sediment of clay. There are slate hills in England out of which great slabs and sheets of slate are "quarried," *i.e.* dug or cut. They are cut into smaller pieces or tiles, and used to roof houses. The sediment of the shells and bones of fishes hardens under pressure into *limestone* or *chalk.*

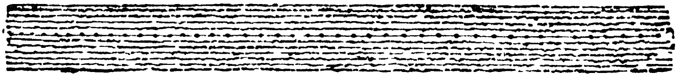


FIG. 29.—SEDIMENTARY ROCK—SANDSTONE.

Lava.—Long ages ago the crust of the earth was not so thick nor so hard as it is now. The liquid rock, under the solid crust, gushed out through cracks in the crust called volcanoes, and flowed over the surface, forming vast layers, sometimes thousands of feet thick, which slowly cooled into solid rock. The Deccan was covered in this way by layer after layer of lava from volcanoes, of which no trace can now be seen. A great plateau was thus raised on the Deccan. Some layers of the lava or volcanic rock were harder than others. The softer rocks have, in the course of ages, been worn away by the rain and wind and rivers; and plains and valleys have been formed in the plateau. The harder rocks remain as hills and mountains, many of which are flat-topped, and have sides which look in the distance like steps or stairs. The rocks which form them are sometimes called *Trap* rocks, from a Swedish word *trappa*, a step. The word Ghats means the same thing, and was given to the Western Ghats for the same reason. The Andes in South America, and the Rockies in North America, were formed in the same way by lava poured out by volcanoes.

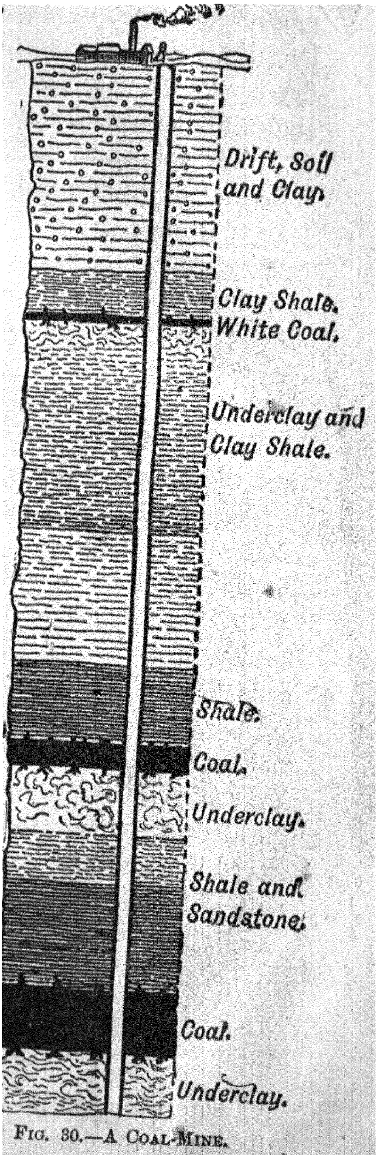


FIG. 30.—A COAL-MINE.

Coal is merely wood hardened into rock, and is composed chiefly of carbon. In former ages, forests covered the face of the earth in many parts of the world. As they decayed, great beds, often hundreds of feet thick, were formed of their dead trunks and branches and leaves. Then the crust of the earth below them sank, the ocean rolled over them, and they were slowly covered with layers of sand or shells, which hardened into sandstone or limestone rock. The enormous weight of the heavy rock and the ocean above it pressed the layer of plants into hard black coal. After a very long time, that part of the crust slowly rose again, and became dry land. In Fig. 30 we see a deep coal-mine. The coal is shown by the black bands lying between beds of stratified rock, of shale, clay, and sandstone. The three bands of coal were formed at different periods, the lowest being formed first. The long white line going down in the middle is the mine or pit. called a shaft, that has been dug through the rock. At the top of it there is a steam engine. It works the machine which lets down the miners in a cage or large basket, and draws up the coal which they dig out of the mine. Any country which, like England, has rich coal-fields is sure to have large manufactures, particularly if there are iron-mines close by, for the coal is used to feed the furnaces in factories and workshops. In cold countries it is also used as fuel instead of wood, to warm houses and to cook food. Coal-gas is made from coal. It is used for lighting and heating streets and houses, and for cooking.

Petroleum is also called kerosene oil and mineral oil. It is formed, like coal, of the remains of plants, and also of the remains of animals—chiefly fishes. Deep down in the earth there are large beds of this matter, pressed down by the heavy weight above them. If a very narrow well be bored into the layer of oil, the pressure at that point is removed, and the oil gushes up, often with great force. The oil is collected and stored in great iron tanks. It is found in Burmah, the United States of America, and other countries.

12. MOUNTAINS.

How they are formed.

We have seen that the crust of the earth is solid rock. Under the soil on the dry land there is rock. Under the ooze or mud at the bottom of the sea there is rock. The rock is not all of one kind. The older or igneous rocks, such as granite, were

formed by the cooling of the liquid crust, and the later or sedimentary rocks, such as sandstone and limestone, were formed out of the sand or dust of the older rocks, which were washed off their surface into the sea. We should expect, therefore, to find rocks like granite at the bottom of the crust everywhere, and rocks like sandstone on the top of them. This is so in many places, for most of the rock on the surface of the earth is sedimentary or metamorphic, *e.g.* lava. But in other places we find wide bands or narrow seams or great masses of igneous rock at the surface or near the surface. They seem to have been somehow pushed up from below through beds of sedimentary rock.

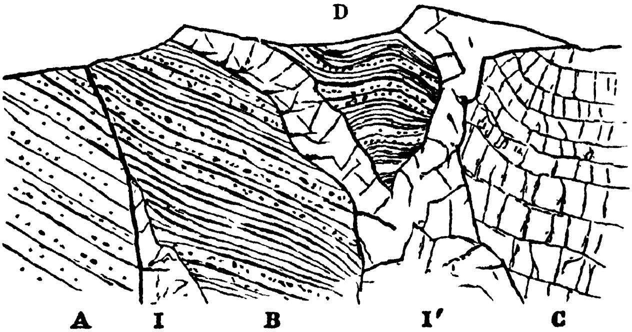


Fig. 31.—Sedimentary Rock, A, B, C; Igneous Rock, I, I′.

In Fig. 31 you see the side and the top of a hill. The soil has been removed and the rock laid bare. Over the letters A, B, C there are strata of sedimentary rock lying in lines. But over I and I′ there is another kind of rock. It is not in strata, but in great lumps which are cracked. It is igneous rock which has been pushed up from below. The mass of rock marked I has not got up to the surface. It divides A from B. Rock I′ has burst through the sedimentary rocks, and divides the block of sedimentary rock D from similar rock on both sides.

What force pushed up this igneous rock from below? Why are these strata of sedimentary rock at the top of a hill? How did they get up there from the bottom of the sea where they were formed? Why are they tilted up on one side instead of lying quite straight as in Figs. 29 and 30? To answer these questions, we must find out how hills and mountains were formed.

When a solid body sinks into a liquid or half-liquid mass, it pushes it aside, and the liquid rises up all round the sinking solid.

The earth was once, as we have seen, a huge globe of blazing gas. As it gradually cooled, the outer crust became boiling liquid rock made up of all the elements, some light, some heavy, some losing heat rapidly, some cooling slowly. In time the liquid rock became solid, but very slowly. Different parts solidified at different rates. Some parts of the crust became solid before other parts, which were still liquid or half-liquid, like glue or melting wax. As great blocks of the more solid and heavier rocks slowly sank into the softer mass around them, they pushed it up on all sides, and in course of time it became solid too. The crust of the earth was then all igneous rock, but not all on the same level.

Into the wide hollows in the crust, formed by the sinking solids, the water rushed and formed seas and oceans. The half-liquid stuff which had been pushed up became hard rock and formed the dry land, the continents, and islands. Through vast periods of time, rain fell on the rocky land and fierce winds blew over it. At length soil was formed, and forests grew up. Rivers rolled over the land, and the running water cut away the softer rocks and formed deep, wide valleys, while the harder rocks remained as hills and mountains. This process is called *erosion*, *i.e.* eating away; or *denudation*, *i.e.* laying bare. Rain, wind, running water, and frost are the chief "eroding" or "denuding" agents. The process is also known as *weathering*, but this term is usually applied to a rock or cliff which has been worn smooth or is crumbling away under the action of the weather, *i.e.* the wind and the rain, or the beating of the waves on rocks on the seashore. A plateau or raised block of land which, like the Deccan, has in course of time been worn down by erosion into hills and valleys is sometimes said to be *dissected* or cut asunder. And mountains and hills formed in this way are often called *Old mountains*, as they were the first to be formed. Other mountains were formed in another way, as we shall see.

For thousands and thousands of years, enormous quantities of stone were washed off the surface of the land, and carried down by the rivers into the sea, and there became sedimentary rock.

What would happen where *two or more* heavy solid blocks of rock sank into the soft yielding mass of half-liquid rock around them? The soft rocks would be squeezed together between the hard blocks. They would be pressed together from both sides. There would be enormous *lateral* or side pressure on them. They would be squeezed upwards, but the top layers of this soft rock would not be level. Any layer of soft matter, if it be pressed on both sides, will rise up in the middle into folds or ridges. In Fig. 32 you see, on the left-hand side, some sheets of cloth pressed down by two stones laid upon them. They lie flat on the table. On the right-hand side, there are the same sheets being pushed or pressed together on both sides. You see how they rise up into folds or ridges in the middle.

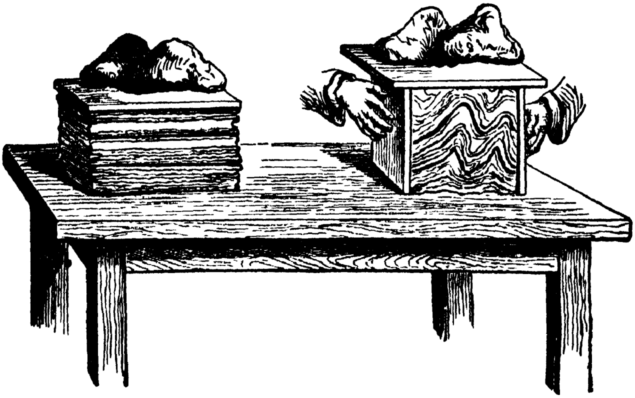


FIG. 32.—EFFECT OF LATERAL PRESSURE.

Compare this picture with Fig. 33, which is a section of a part of the Alps in Switzerland. You see how these great mountains look like the sheets of cloth pressed together in Fig. 32. Like the cloth, they have been under enormous lateral pressure. The stratified rocks which once lay flat, horizontally, at the bottom of the sea, have been pushed up into huge folds, now mountains, and have been tilted up so that they now lie in a nearly vertical or upright position.

This, then, is a *second* way in which mountains have been formed, viz. by lateral pressure due to the cooling and contracting of parts ot the *outer or upper* crust of the earth. The mountains formed in this way are called *Folded* mountains, because they were pushed or *thrust* up in huge folds of rock. They were formed, probably, millions of years ago, but they are young mountains compared with still older mountains of igneous rock. Like them, they too have been exposed for long ages to erosion, and are being gradually worn down, and carried by running streams into the valleys, or away to the sea.

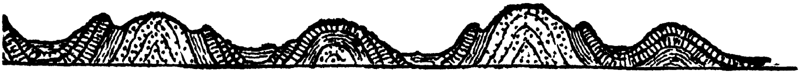


FIG. 33.—SECTION OF A PART OF THE SWISS ALPS.

Folded mountains are also formed in another way. The cooling of the earth has never stopped. In the course of ages, the *lower* layers of the earth's crust began slowly to cool and contract, and, while so doing, they *pulled* together with enormous force the upper layers which rested on them. Parts of the upper crust were slowly pushed upwards in great folds or ridges.

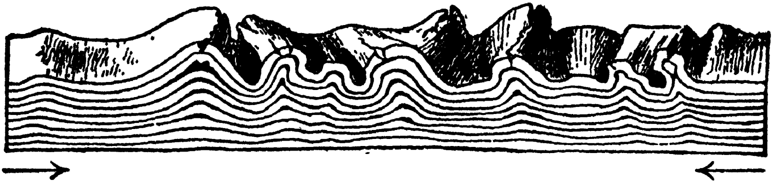


FIG. 34.—CONTRACTION OF CLAY ON INDIA-RUBBER.

If several layers of clay be pressed firmly down upon a thick sheet of india-rubber stretched out forcibly beneath them and the rubber be let go, it will at once contract to its former size and pull together the layers of clay. The result of this force of contraction is shown in Fig. 34. The upper layers of clay are pushed up, as you see, into folds or wrinkles. The topmost layer is cracked across in several places.

Just so, the contraction of the lower layers of the earth's crust forced the upper layer into huge folds or ridges, which are now great mountain ranges like the Himalayas, and are called Folded mountains. The topmost layer of rock in the upper crust cracked in long lines, and through these cracks great volumes of gas and boiling rock, known as lava, burst out from the interior of the earth. The cracks in the crust are called volcanoes.

In Fig. 35 you see a section of the Himalaya Mountains from the Siwalik Hills to beyond Simla. The whole of this part is sedimentary rock, which once lay at the bottom of the sea, as may be seen from the long lines of strata. Once they were level horizontal layers. But they were pushed up into ridges or folded mountains by the force of contraction. At *a*, which shows the Siwalik Hills, the strata are still nearly level, but at *b* and *e* they have been tilted straight up on end, and from *e* to *f* they have been twisted up and down like the cloth in Fig. 32. At *e* there is a great crack in the crust of rock.

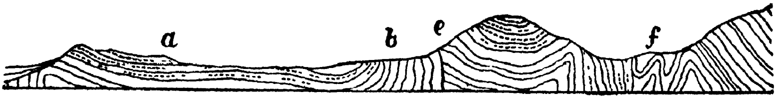


Fig. 35.—Section of the Himalaya Mountains—Simla Range.

This is the *third* way in which mountain ranges have been formed, viz. by the contraction of the *lower* layers of the earth's crust, which forced up the bottom of the ocean in some places, and low-lying plains in other places, thousands of feet into the air, forming folded mountains, which are young mountains compared with the more ancient mountains already described. They are loftier than the old mountains, their peaks are more pointed, and their sides and cliffs are steeper, because the agents of denudation—the rain, the wind, and the frost,—although they are always at work, have not yet had time to wear them down like the older mountains.

The *fourth* way in which mountains are formed is by the overflow of lava from volcanoes. This raises what are known as *Volcanic* mountains, which will be described in the next lesson.

Hills are lower than mountains and have been worn and weathered down from mountains. Hills are in fact very old mountains. The common phrase, "as old as the hills," may remind us of this. The term "hill" is sometimes limited to heights of 1000 feet to distinguish them from mountains, but this rule is not always kept. The Nilgiri Hills. *e.g.*, are over 6000 feet high.

13. VOLCANOES AND GEYSERS.

A *Volcano* is a great crack in the rocky crust of the earth, going right down to the layer of igneous or melted rock which lies below it. Through the crack the melted rock sometimes bursts out with gas, steam, ashes, and dust, and rushes like a river over the land around it. This liquid rock is called *lava.* The mouth of the crack looks like a great round hole in the ground. It is called a *crater* or cup. When the lava flows over the sides of the crater on to the ground, it slowly cools, and after a while it becomes solid rock. As stream after stream is poured out all around, a hill is gradually formed. The hill gets higher and higher and becomes a mountain which is often thousands of feet high. **Cotopaxi** is a giant mountain in the Andes in South America, which rises about 19,500 feet above the sea. It has been built up out of lava. Its upper part of 3500 feet is a cone covered with snow. Out of the crater at the summit, hot ashes and dust and stones are from time to time hurled high into the air and scattered all over the land around it.

Fig. 36 shows what the inside of a volcano would look like, if it were cut asunder. There is the wide crack in the middle, going down deep through the crust of stratified rock, to the liquid rock below. There is the black lava bursting up into the air with clouds of steam, and the crater at the summit of the hill that has been formed. Besides the main crack, there are other narrower ones, some not going up to the surface. Two have made *minor*, *i.e.* smaller, cones and craters for themselves.

Such floods of lava were poured out by volcanoes in past ages that the land in many parts of the world was covered with it for hundreds and hundreds of miles. The old valleys, that had been formed in ages still further back, were filled up, and vast plateaus of lava rock were formed. In India, the Deccan is a huge sheet of lava, thousands of feet deep This lava plateau was long ago "dissected," and new hills and valleys formed, and covered with soil. All traces of the ancient volcanoes have disappeared.

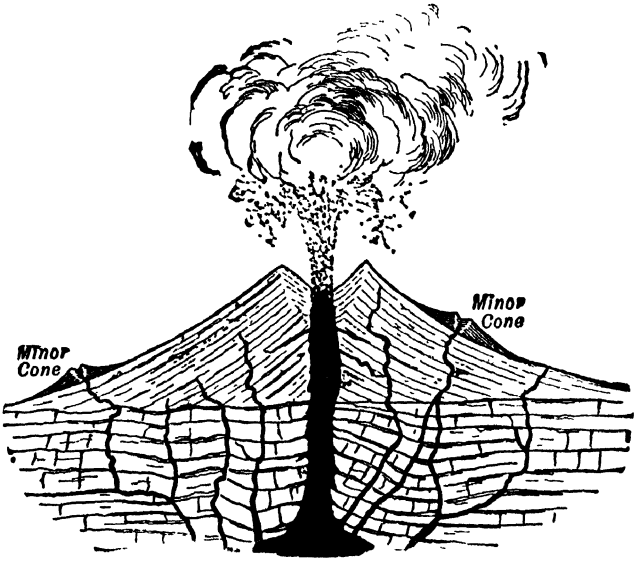


FIG. 36.—SECTION OF A VOLCANO.

What makes the liquid rock gush upwards through the cracks in the earth's crust?

The lava is forced upwards by immense quantities of steam. The rocky crust is full of narrow winding cracks everywhere. Through these cracks water is always sinking. From the bottom of the sea, from the bottom of lakes, from the beds of rivers, from the land on which rain falls, water is always finding its way deep down into the crust of the earth where it is intensely hot, so that the lower the water goes, the hotter it gets. At last it boils and becomes changed into steam. When the pressure of the steam upwards is greater than the downward pressure of the weight of the rocks which lie above it, it bursts upwards, like the steam in a kettle, which lifts the heavy iron lid, and would blow it off if it were fastened down. As the steam rushes up, it carries with it molten rock or lava and gases. The bursting out of the lava is called an *eruption*. One of the great volcanoes of the world is **Vesuvius** in Italy.

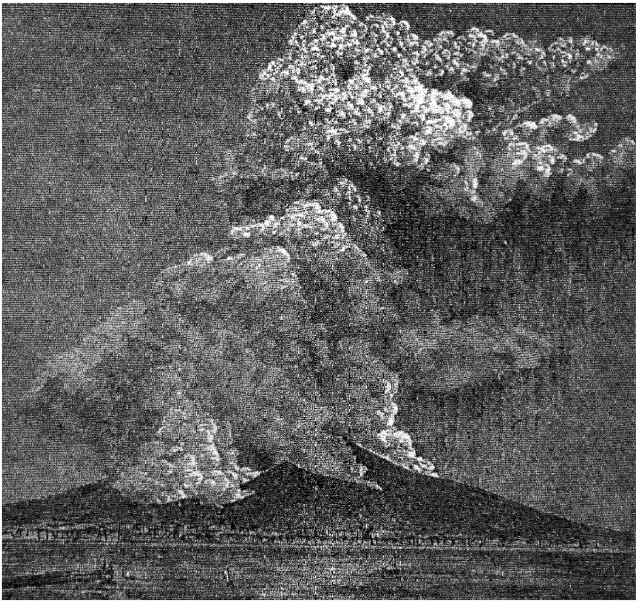
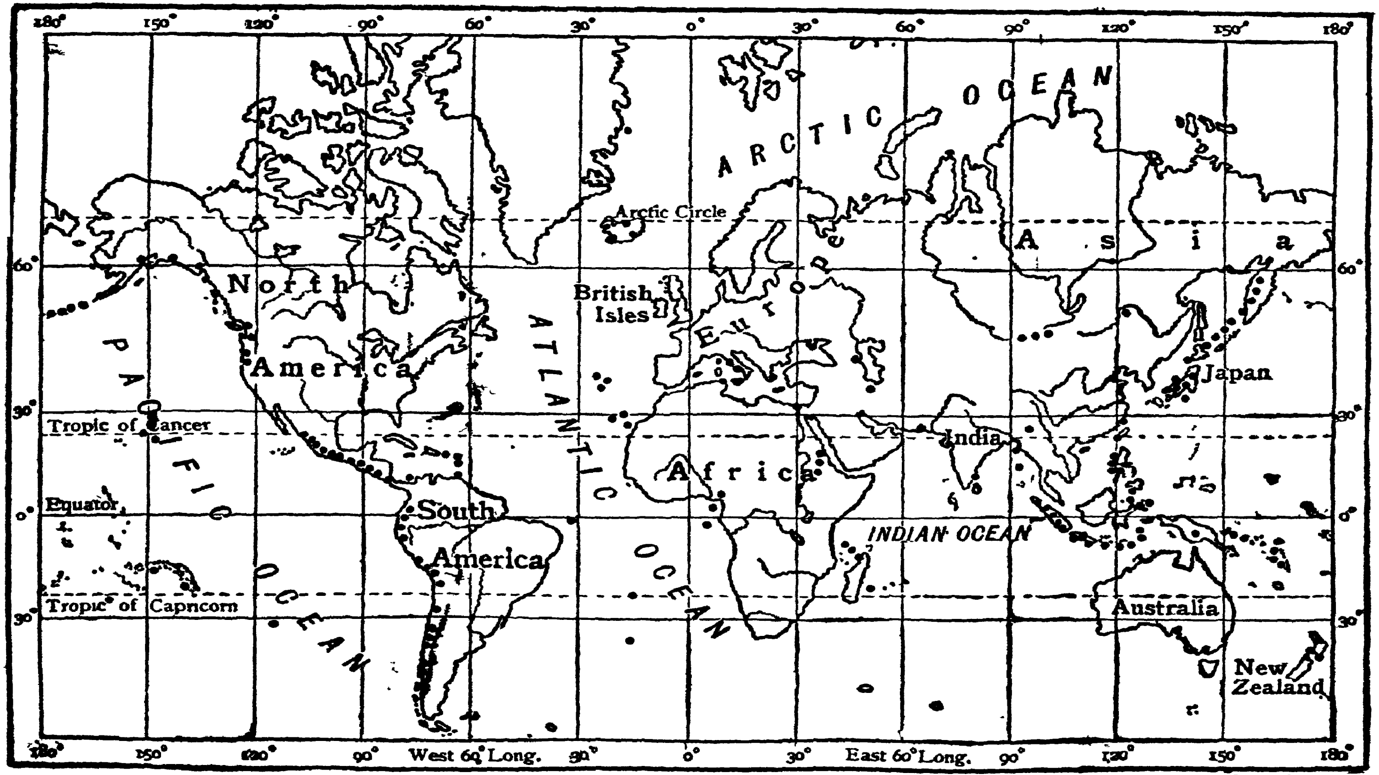


FIG. 37.—VESUVIUS IN ERUPTION.

In an eruption of Vesuvius, great clouds of glowing gas and smoke and black dust and steam burst upwards hundreds of feet into the air, and streams of lava follow. The steam condenses into water as it rises into the cold air and falls in showers of rain. The clouds along the sides of the hill in the picture are the steam and smoke rising from streams of lava flowing down from the crater.



Emery Walker sc.

FIG. 88.—CHIEF VOLCANOES OF THE WORLD MARKED WITH BLACK DOTS.

In some volcanoes, the eruption ceases when the steam has spent its force. The crack in the earth may get choked up and the sides may fall in, and the crater fill up in course of time. The volcano is "silent." If no eruption has taken place within the memory of man, it is said to be extinct. In distant ages in the past, when the earth's crust was thinner and softer than it is now, there were probably many more active volcanoes than there are at present. Extinct volcanoes are found all over the world, and even where there is now no trace of a volcanic mountain, the lava, which makes the soil, shows that volcanoes were active there at some past period.

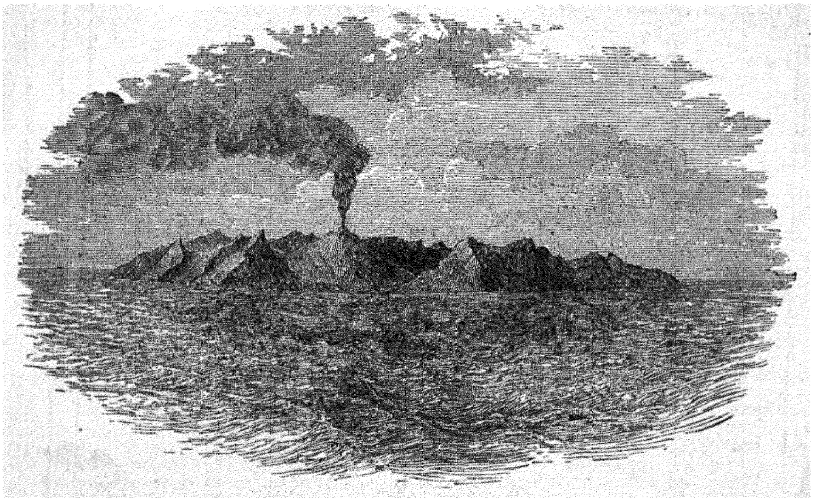


FIG. 39.—BARREN ISLAND.

In many places, volcanoes are ceaselessly in action. In the Mediterranean Sea, the great island volcano, **Stromboli**, lies in the route of steamers from Port Said in Egypt to Marseilles in France. It rises out of the sea to the north of Sicily, where there is another active volcano, **Etna.** Stromboli is a huge mountain of lava. Smoke is nearly always rising from one of the craters on it, and streams of lava may be seen flowing down its sides into the sea.

Many of the volcanoes of the world are found in long lines on the borders of the Pacific Ocean, along the western coast of America and the eastern coast of Asia. They are in ranges of mountains or on islands which are really the summits of mountains rising out of the sea. The map on page 53 shows where the chief volcanoes of the world lie. The lines mark deep cracks or fissures in the crust of the earth, reaching down to the molten rock below. In the map, the black dots mark the volcanoes. There is a long line of these dots along the great ranges of the Andes, the Cordilleras of Central America and the Rockies of North America. The volcanoes in the Andes are still active, but those in North America are extinct. The line of active volcanoes is seen again in the peninsula of Alaska and the Aleutian Islands. It continues down the coast of Asia along Kamchatka, the Kurile Islands, Japan, Formosa, and the Philippine Islands. Another belt of volcanoes runs through Sumatra, Java, and the Sunda Islands.

In the Indian Ocean, among the Andamans, lies the solitary volcano known as **Barren Island.**

The belt is continued eastwards through New Guinea and other groups of islands to New Zealand, and seems to end in this direction in Mount Erebus, a great volcano on the Antarctic continent.

The islands in the Pacific are all volcanic, except the Coral Islands. In many of them there are active volcanoes, *e.g.* the Sandwich Islands. The Fiji Islands are extinct volcanoes.

A short line of volcanic islands occurs in the West Indies, some of which are still active. There is another line down the great rift valley and the mountains on the east coast of Africa (p. 377). **Kilimanjaro**, in this region, is a great volcanic mountain.

If the map, showing these lines of volcanoes, be compared with that of the great world ridges on p. 60, it will be seen that a large part of the mighty ridge which goes round the land mass of the globe is volcanic.

There are many other volcanoes which occur singly. Elburz in the Caucasus, Mount Ararat in Asia Minor, the Azores, the Madeiras, the Canary Islands and Teneriffe, Ascension Island, Mauritius, and St. Helena are all volcanic.

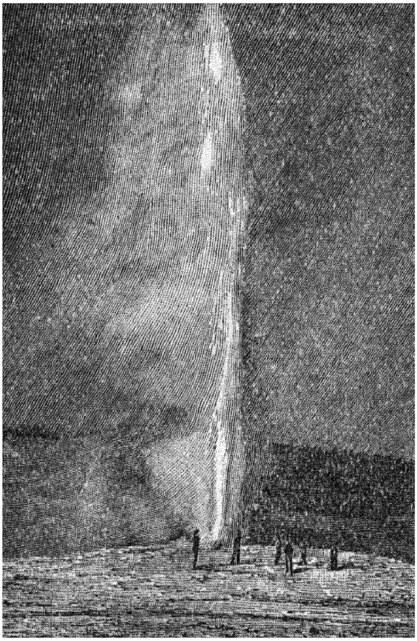


FIG. 40.—"OLD FAITHFUL" GEYSER.

Geysers.—Much of the water that sinks into the earth gushes upwards through cracks in boiling springs. Water and steam burst out at intervals, and rise sometimes in fountains to the height of one or two hundred feet. They are called in Iceland geysers, *i.e.* "gushers" or "roarers." They are long cracks like pipes which go deep down through the rock to pools of intensely hot water below. They are usually found near volcanoes, and are common in Iceland, New Zealand, and the "Yellowstone Park" in the United States, where there is a famous geyser known as "Old Faithful" which bursts out about once an hour.

14. EARTH MOVEMENTS.

EARTHQUAKES.

WE saw in Lesson 10 that, millions of years ago, parts of the crust of the earth sank, and oceans filled the hollows thus formed. Other parts rose, forming continents and islands. This rising and sinking, these *slow movements* of the earth, were very gradual, and were repeated through vast periods of time. They are often termed "*secular*" or age movements. The lands of ancient time sank and became sea, and the ancient ocean beds were upheaved and became dry land again and again.

Even now these slow movements are going on, for the earth is still cooling, but the movements are so slow that men living in any one age do not notice them. We know that the level of the land is being raised in some parts of the world, because we find beds of shells of sea animals, like those now living in the sea, embedded in the sides of cliffs on the sea coast, at heights from 100 to 1000 feet. They were once under the sea or on the sea-level. They never moved from the land in which they were then fixed. The land itself has moved slowly upwards to its present height. And in many countries there are raised beaches along the coast. They have marks on them to show that the sea once rolled over them. Pebbles and rocks worn down by the sea-waves are fixed in them. They now lie in flat stretches of sand from 50 to 100 feet above the present level of the sea. In Fig. 41 the land has risen at least four times, as the lines of the sea-strands on the sides of the wall show. Each line marks the level of the sea. In some places there are ancient buildings, which we know were once on the sea-level, now standing on land high above the sea. In Southern India there is a well-known legend that has come down from very early times. It is that the coast of Malabar at one time lay beneath the Indian Ocean, but that the hero Parasuram raised it from the deep and made it dry land.

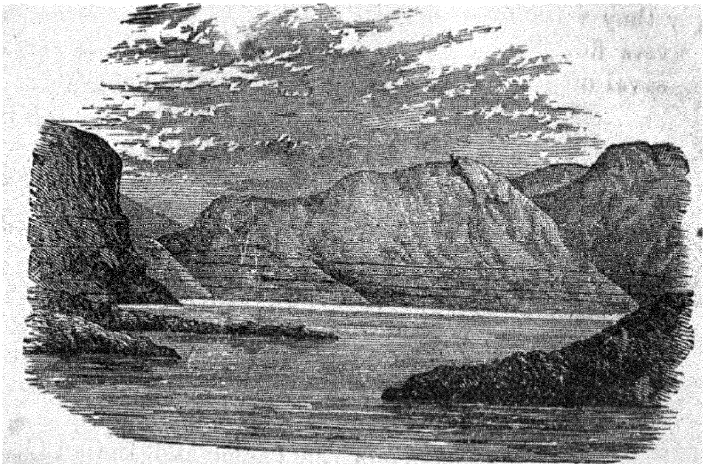


Fig. 41.—Raised Sea-Strands.

On the other hand, the level of the land in some parts is slowly sinking. This has happened within the memory of man. On the coast of England trees which grow only on land may still be seen under the water, proving that the land has sunk and the water has risen and covered them. It is believed that the *fiords* or deep inlets of the sea on the coast of Norway, the similar inlets on the south-west coast of Ireland, and those on the north-west coast of Scotland are "*drowned valleys*," that is to say they were once deep river-valleys on the land, down which rivers flowed into the sea. But the sea, owing to the slow upheaval of the ocean bed, rose and filled or drowned them.

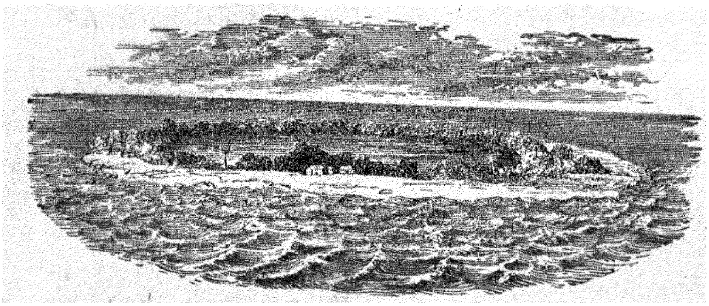


FIG. 42.—CORAL ISLAND.

The coral reefs and islands in the Pacific and Indian Oceans are slowly sinking. The coral is the work of a small sea animal that builds up reefs in the sea. It cannot live below a depth of about 120 feet, but the coral reef has been found at a depth of 1800 feet below the sea-level. This shows that the reef must have sunk to that depth An *atoll* or coral island is a ring of coral rising out of the deep sea. It is only about a quarter of a mile broad, The rough waves break on its outside face. Inside there is a lagoon or shallow lake of still salt water.

Besides these slow movements of the earth there are often *sudden* movements of the rocky crust in different places. These are called EARTHQUAKES, *i.e.* earth shakings. A part of the surface suddenly moves up sometimes an inch or so, sometimes a few feet. In Chile in South America there was a great earthquake in 1822, when 100,000 square miles were suddenly lifted about 4 feet. In Cutch, in India, there was an earthquake in 1819, when 2000 square miles of land suddenly sank a few feet and the sea rushed in and covered it. At the same time a long strip of land 50 miles long and 10 miles broad rose 10 feet. Earthquakes usually occur in volcanic regions, and are caused in the same way and by the same movements as fold or crumple the rocky crust of the earth into mountains. Sometimes the ground seems to rock to and fro, and sometimes a slight earth-wave is felt like a low wave of the sea. Buildings are thrown down and many people killed by a severe earthquake.

15. CONTINENTS, WORLD RIDGES, AND WATERSHEDS.

IN Fig. 43 we see the great land masses of the globe, *i.e.* the continents and large islands, with the huge ridges we call mountains, rising above the face of the land, and the oceans which lie all round them.

Arrangement of Land and Sea on the Surface of the Earth.—The *first* point we notice is that there is much more water than dry land on the surface of the earth. There is about two and a half times as much sea as there is land. Look also at Figures 44 and 45.

Secondly, most of the land lies north of the equator, *i.e.* in the northern hemisphere, in which there is about thirteen times as much land as there is in the southern hemisphere. The great masses of land lie in a vast semicircle or curve like a horse-shoe, most of which is in the northern hemisphere, with the Atlantic Ocean in the middle and the Pacific Ocean outside.

Thirdly, three of the continents, North America, South America, and Africa, are triangular in shape. These great triangles have wide bases to the north and taper down to a point in the south. The vast continent of Eurasia, *i.e.* Europe and Asia, appears to be broad rather than long, like the others. But nearly all its southern countries are peninsulas which are more or less triangles,

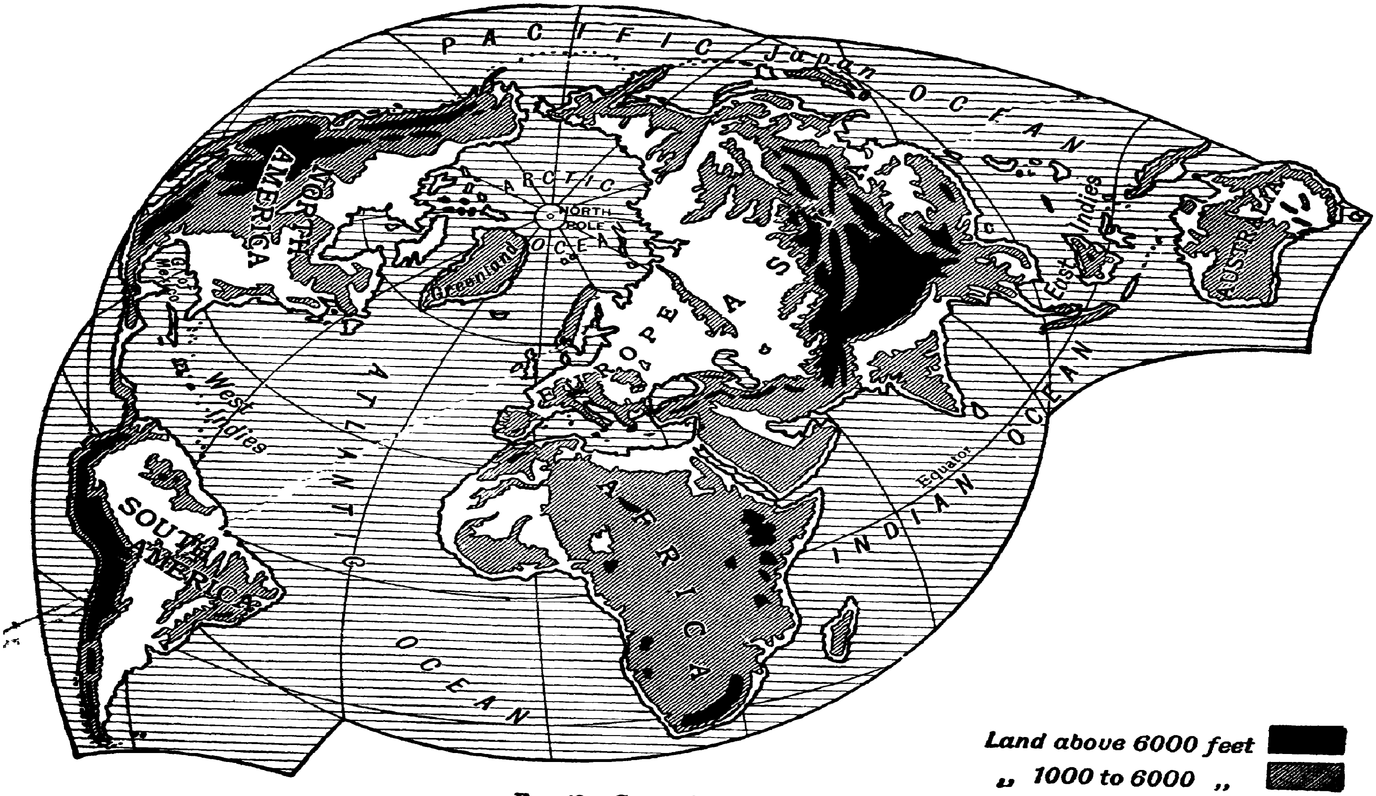


Fig. 43.—Great World Ridges.

pointing to the south. India is quite a triangle, and Spain, Italy, the Balkans, Arabia, Burma, Siam, and the Malay Peninsula all point southwards There are, it is true, a few exceptions, *e.g.* Denmark, Yucatan, and Labrador, but the general rule is that all the land masses are broad in the north and taper down southwards.

Fourthly, the broad northern bases of North America and Eurasia and Greenland form an inner horse-shoe or ring of land around the Arctic Ocean, the North Pole being in the middle. From this northern base the land stretches away in continents southwards. In ancient times, Europe and Africa were one great continent. No strait then separated them. Animals could pass from one to the other. There was no Mediterranean Sea. The mountains of northern Africa are the same in build as those of southern Europe, and were probably formed at the same time.

Fifthly, around the North Pole there is the ocean. Around the South Pole there is a continent called Antarctica, recently discovered. It is covered by a huge sheet of ice.

The word *Anti-podes* means "opposite (our) feet." Those who live on the opposite side of the globe to us are our antipodes. The antipodes of any piece of land or water is the land or water lying directly opposite to it on the other side of the globe. Figs. 44 and 45 are two hemispheres called land and water hemispheres. They are made by drawing two circles round the globe, so that one half of the surface may have as much land in it as possible and the other as much water as possible. These Figures show what is called the "antipodal arrangement" of land and water. The antipodes of any point in either of these hemispheres is in the other. It will be seen that the antipodes of land, in nearly every case, is water, and the antipodes of water is land.

These Figures also show that the British Isles with London are very nearly in the centre of the land hemisphere, and that New Zealand, which is almost their antipodes, is very nearly in the centre of the water hemisphere. The situation of London is one reason why it has become the centre of the world's commerce and the largest city in the world.

The Great World Ridges.—New let us turn again to Fig. 43.

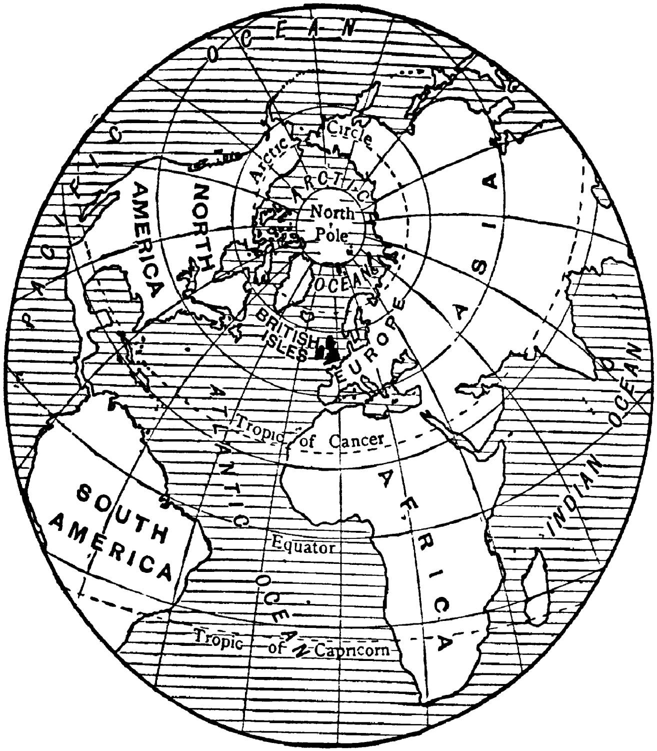


Fig. 44.—Land Hemisphere

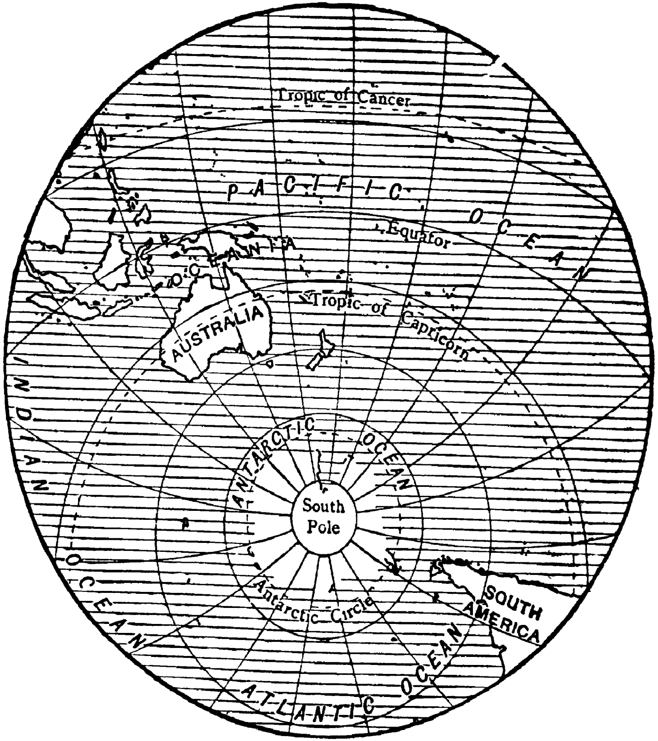


Fig. 45.—Water Hemisphere

We see two great world ridges. One is a mighty mountain range which stretches, like the nails round a horse-shoe, along the outside of the great land masses for thousands of miles. It is called the Andes in South America and the Rockies in North America, and runs north and south for a distance of some 9000 miles along the western coast, forming, so to speak, the backbone of these continents, which run in the same direction, north and south. It is continued right up to the north-eastern corner of Asia. From that point it runs for some 9000 miles farther, down long lines and groups of islands on the eastern coast of Asia, the Aleutian and Kurile Isles, the Japan and Loochoo Isles, the Philippines, and Borneo, to New Zealand. These long lines of islands are the summits of mountains which once formed one long ridge or range like the Andes. They have sunk, so that their slopes are hidden by the waters, and their bases rest on the bottom of the Pacific Ocean. If, now, we look at Fig. 38, we shall see that this is the great *volcanic* range of the world. It marks a great crack in the rocky crust, up which lava gushed for long ages and piled up huge mountain ranges.

The other great world ridge is known as the Alpine-Himalayan system of mountains. Its general direction is east and west across the great continent of Eurasia. It is so called because it includes the Alps in Europe and the Himalayas in Asia. It extends, for over 12,000 miles, from the mountains of Spain, in the south-western corner of Europe, to the north-east of Asia, along the south of Europe and the centre of Asia. Here it divides into a northern and a southern branch, which uphold between them the huge block of elevated land known as the plateau of Central Asia and Tibet. Branches run off from the main range in many directions. They are all true *folded* mountains, formed in the way described in Lesson 12. They were squeezed up by the sinking of the earth's crust to the north and to the south. To the north, the sinking is marked by the great plains of the north of Europe and Asia and to the south by the still deeper hollows now filled by the sea.

Great World Watersheds.—It will be seen that the lie or direction of the continents follows the direction of the great mountain ranges. In each of the continents there is an *Axis* or *Watershed* or "*Divide*" or *Water-parting.* All these terms are used to denote a crest of rising ground from which the land slopes down on either side to the sea. This axis need not lie in the centre of the mass of land nor need it lie on the highest mountains. It is the line of *average* height of the land and it is marked by the way in which the rivers flow down each side of it. On any map the direction of the rivers shows the slope of the land. The great axis or watershed of South America lies close to the Pacific coast, just as in India the watershed of the Deccan lies along the Western Ghats. In both, short rapid rivers flow down the western slope and long rivers flow slowly down the eastern slope. In Europe, the *Divide* runs through the chain of the Pyrenees between France and Spain, the Alps, the Carpathians and the Caucasus up to the Caspian Sea. When the axis is in the middle of a country, the length of the slope on both sides to the sea will be about the same. But when it lies close to one side, the slope is short and steep on the sea side and long and gentle on the opposite side, as it is, *e.g.*, in South America. The steep side is called the *scarp* or the *escarpment.* In South America the crest of the watershed runs along the lofty summits of the Andes at a distance of from 50 to 100 miles from the Pacific Ocean. The scarp falls sheer down from 10,000 to 20,000 feet on this side. But on the opposite side there is a long slope of 2000 miles to the Atlantic. In the Deccan, the western scarp of the Western Ghats is from 3000 to 7000 feet steep, and the slope at its base is from 10 to 50 miles wide, while the opposite slope runs down for hundreds of miles to the Bay of Bengal.

Secondary Watersheds.—It will also be seen, from the physical maps of the continents in this book, that where the main axis of a continent is on one side, *e.g.* in South and North America, a second watershed or mountain ridge runs down the opposite side, fronting the smaller ocean. In North America this secondary ridge is seen in the Alleghany and Appalachian Mountains, in South America in the Sierras of Bra[illegible]. In South India this line is marked by the Eastern Ghats. When continents have highlands on both sides, like this, there are wide plains or low plateaus between them. In North America there are the great plains of Canada and the prairies of the Mississippi. In South America there are the Pampas, the Selvas, and the Llanos. It was, in fact, the sinking of these plains on the one side and the still deeper sinking of the ocean plains on the other that cracked the crust of the earth and forced up the mountains between them by lateral pressure from the east and the west.

16. MAPS AND MAP MAKING.

As the earth is a ball, the best map of the world that can be made is one drawn on the outside of a ball, such as you may see on a "terrestrial globe" in a good school. But on a globe like this, only a very few names can be put. If many names were printed on a globe—like those in wall-maps or an Atlas—it would be too large for use and would be very costly to make. We have, therefore, to draw our maps on flat sheets of paper, like those in this book.

But the surface of the earth is not flat. It is a curve, and a curved surface cannot be shown exactly on flat paper. Try to fit a piece of paper on to a globe and you will see that you cannot do it; there will always be creases in the paper. A map that is perfectly correct cannot be drawn on flat paper, but one can be made that is *nearly* correct.

The parallels of latitude and meridians of longitude, which cross one another on a globe (see Fig. 11), enable us to fix the exact position of a place. In making a map, the first thing we have to do is to transfer these cross lines to paper. This transference is called *projection*, which means "throwing forwards"—as a shadow is thrown forwards or projected on the ground by a man standing with the sun behind him. In fact, a projection is a shadow, and any shadow is a projection.

Imagine that you have a large hollow glass globe, with the cross lines marked in black on the outside, and that there is a bright lamp inside, in the middle of the globe. Imagine also that there is a sheet of paper held upright, outside the globe, close to it. The black cross lines of the globe would cast their shadows on the sheet of paper. They would be projections of the lines. If you were seated on the other side of the sheet of paper you would see these shadowy lines or projections on it. They are like the lines you see on a map.

This is the principle on which maps of the world in hemispheres or half-globes are drawn. The method is known as *globular projection.* Here is a figure which explains it. In this hollow hemisphere or half-globe, *abc* shows the outside curved line on which the parallels of latitude are marked. You are supposed to be looking at it from the other side, and your eye is at the point *g*. The space *adce* is the opening of the half-globe, into which you are looking. It is termed "the plane of projection." The parallels are shown as they would appear to your eye when looking at the inside, or concave part, of the globe. The dotted lines are the lines of sight from your eye to the lines on the globe. The meridians are not put in, as the lines would crowd the figure too much. Fig. 11 in this book shows both parallels and meridians drawn on the plane of projection. Maps drawn on this globular projection show the sizes of the continents and their positions fairly well.

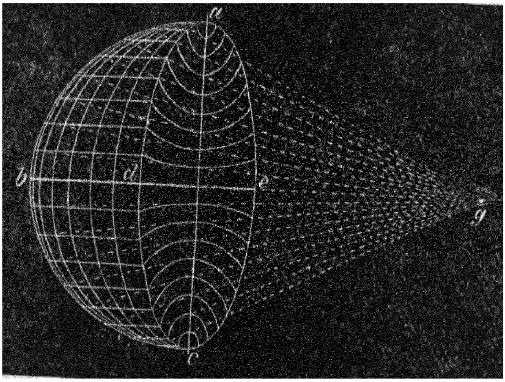


FIG 46 – GLOBULAR PROJECTION.

But sailors find another kind of map more useful. It is called the *Mercator* map, after a man of this name who invented it in the year 1569. The projection on which it is made is known as the Mercator projection. Map 5 of the British Empire in this book is a map of the world on Mercator's projection. Do you see anything wrong in this map? Yes, the sizes of the countries are much larger than they ought to be, as we go northwards. Greenland, *e.g.*, looks as large as Africa, but Greenland measures only 1400 miles from north to south, while Africa measures 4000 miles and is therefore about three times as long. Take your foot-rule and measure the distance from the equator to parallel marked 15°. Then measure the distance from parallel 60° N. to 75° N. You will find that the distance between the two latter lines is about three times that of the former, although both are only 15°.

The Mercator map is drawn on what is called a *cylindrical projection*, because the lines are projected on a cylinder, as in Fig. 47, in which the glass globe is supposed to be enclosed in a cylinder or hollow roll of paper. Here the globe *enrs*, with the parallels and meridians marked on it, is enclosed in a roll of paper *abcd*. Suppose that there is a bright light placed in the centre of the globe, then it will project the shadows of these lines on to the paper, looking as you see them in the figure; those close to the light being closer together than those higher up; *e.g.* the distance from 10° to 20° (*i.e.* ten degrees) is much shorter than the same distance (of ten degrees) from parallel 50° to 60° and still shorter than the distance 70° to 80°. The shadows spread out wider and wider as they go more and more to the north. The meridians are not altered, they go up and down at the same distance They are not shown in the figure, as they would crowd it too much. If this map were unrolled, the cross lines would look like those in Map 5. The great advantage of a Mercator map is that the whole world can be shown on one sheet and that the lines are all straight

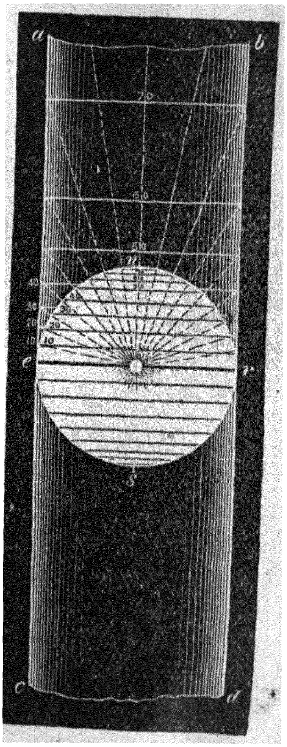


FIG. 47.—CYLINDRICAL PROJECTION.

and all parallel. Compare Map 5 in this book with Map 4, in which the cross lines are curves.

In looking at a map (other than a Mercator map) always refer to the *scale* on which the map is drawn, if you want to know the size of a country. The scale is always shown at one corner of the map. In Map 5, *e.g.*, the scale is about 100 miles to an inch. This means that an inch on the map represents a real distance of 100 miles. So, with your foot-rule, you can always measure the exact distance from one place on the map to another.

The *relief*, *i.e.* the different levels of the land—the heights,

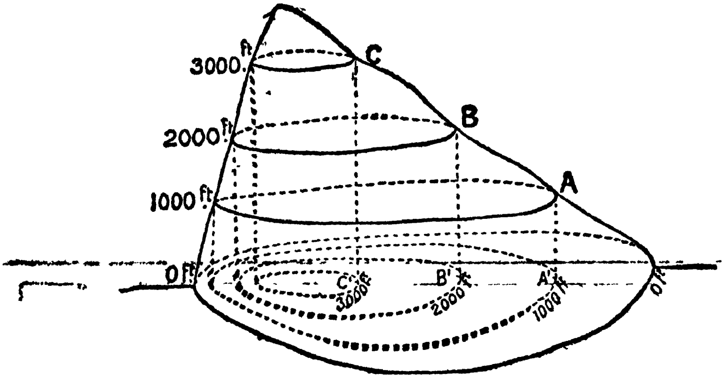


FIG. 48.—HOW CONTOURS SHOW RELIEF.

the mountains, and the hills—are shown in maps in different ways. In this book one way in which relief is shown is by colour. In Map 6 (of India), *e.g.*, eight shades of colour show eight levels of land from the sea-level to 18,000 feet and above. The depths of the ocean are in some maps shown in tints of blue. In Map 6, *e.g.*, the light blue shows the depth of 100 fathoms (=600 feet); the dark blue shows deeper water. Heights are often shown in maps by *contours* or *hachures.*

Contours are lines which mark the same level all over the ground.

In Fig. 48 the heights from 0 to 3000 feet are shown by the dotted *contour* lines below. On the map the land rises from 0 or the sea-level to A, or 1000 feet; then to B′, or 2000 feet; then

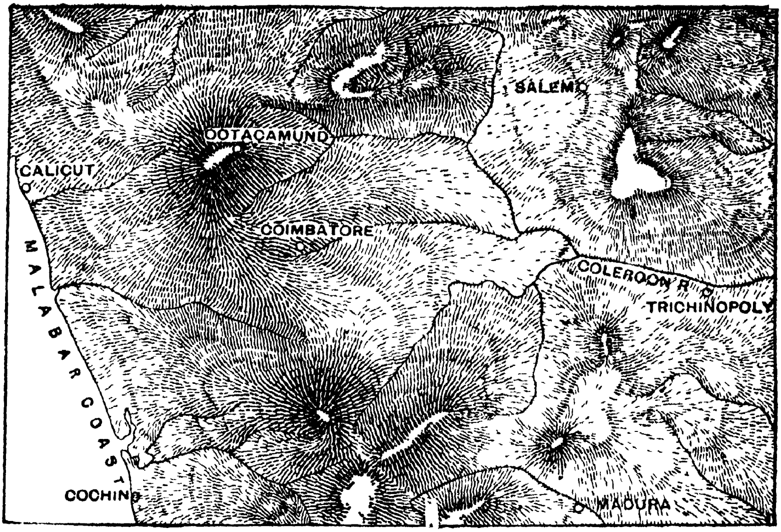
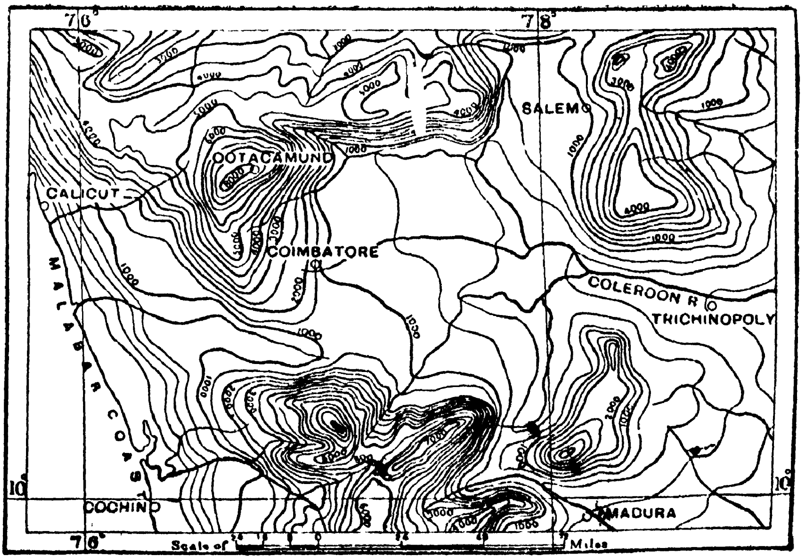


FIG. 49.—HOW HACHURES SHOW RELIEF.



Note The Contours below 1000 Ft have been calculated at 200 Ft apart taking the Coast line at 0 and those above at intervals of 500 Ft

FIG 50—RELIEF SHOWN BY CONTOURS.

to C′, or 3000 feet. Here the distance between two contour lines is 1000 feet. But the distance may be any number of feet. The closer the lines are to one another, the steeper is the land. Fig. 50 shows a part of South India in which the levels are shown by contour lines. Up to the height of 1000 feet the rise from one line to another is 50 feet. Above 1000 feet the rise is 500 feet between the lines. You see how wide apart the lines are in the low country, and how close together they are around Ootacamund on the Nilgiri hills.

Height is also shown by *hachures* or shading, as in Fig. 49, which represents the same country that Fig. 50 does, but the height is shown in a different way. The darker the shading is, the higher the hills are.

17. THE BRITISH EMPIRE.

THIS vast Empire includes countries in every continent in the world, and islands in every ocean. All of these are shown in the Chart of the World in the large coloured Map 5. In it there are three shades of red. The deep tint of red is on the British Isles, India and Ceylon, for these three are ruled directly by the King and his Parliament. From this point of view, they are more closely connected than any other countries in the Empire. With them are included hundreds of islands in the Atlantic, Pacific, and Indian Oceans. A line of red is drawn under each island or group of islands.

A lighter tint of red marks the great self-governing states and colonies, including the Dominion of Canada, Newfoundland and New Zealand, the Union of South Africa and the Commonwealth of Australia. Each of these has its own Parliament and manages its own local affairs, but has a Governor appointed by the King, and it helps in the defence of the Empire to which it belongs.

A complete list of all these countries is given in Appendix I. at the end of this book. In it, the area, population, value of exports and imports, and number of miles of railway open, are noted.

The area of the whole British Empire is about 13 million square miles, which is a little more than one-fifth of the whole land surface of the globe. The population is about 440 millions, more than a quarter of the population of the whole world.

In the deadly war waged in 1914–1918 by the British and their Allies—the French, Russians, Italians, Belgians, Roumanians, and Serbians, and the United States of America—in the defence of justice, honour, and civilisation, against the Germans, Austrians, Turks, and Bulgarians—soldiers came, of their own accord, from every part of the Empire to help their king and their country. Gallant Indian troops fought side by side with their brothers-in-arms—Canadians, Australians, and New Zealanders—under one flag, in one common cause.

The chief countries, stations, and large islands in the British Empire, besides the United Kingdom, are these:—

In **Europe** and the Mediterranean Sea—Gibraltar, Malta, Cyprus.

In **Asia**—India, Burmah, Ceylon, Aden, the Straits Settlements, Singapore, British North Borneo.

In **Australasia**—Australia, New Zealand, Tasmania.

In **North America**—Canada, Newfoundland, the West Indies.

In **South America**—British Guiana.

In **Africa**—British South Africa, British West Africa, British East Africa, British Central Africa, and the Anglo-Egyptian Sudan. There are, besides these, many smaller islands, of which a list is given at the end of the book.

The heart of the British Empire is London. Here the King-Emperor usually lives, although he visits all parts of his dominions from time to time.

We will first describe the British Isles, then India and Ceylon, which are, as we have said, more closely united, under one government, than the other parts of the Empire.

18. THE BRITISH ISLES.

When we talk of the British Isles, we think chiefly of Great Britain—including England, Scotland, and Wales—and Ireland. These are the two largest of a group of about 5000 islands. Nearly all of them, however, are tiny islets, uninhabited. The larger islands are:

The Hebrides, Orkney and Shetland Isles, north of Scotland.
The Isle of Man, in the Irish Sea.
Anglesea, off the north-western coast of Wales.
The Isle of Wight, off the southern coast of England.
The Channel Islands, in the English Channel.

Another name for the British Isles is the **United Kingdom.** In old times there were several kingdoms in it, but they are now *united* under one government, and this is why the term United Kingdom is used.

The area of the United Kingdom is about 121,000 square miles. It is, therefore, about the same size as the Bombay Presidency (including Sind) which has an area of 123,000 square miles. The population is about 47 millions, about the same as that of the United Provinces, and that of Bengal.

The extreme south-western point of the island, extending far into the Atlantic Ocean, the end of the land, is called Land's End. It once reached still farther out to sea, as the rocks, not yet washed away, show. In time they too will disappear. On the farthest rock there is a lighthouse to warn ships away from the rocks.

Great Britain is, in shape, like a triangle pointing northwards, with a base of about 330 miles. The *coast* of this large island is nowhere one long straight line. It is everywhere *broken* and irregular. All along the coast, the sea runs up into the land by many openings or long "arms," inlets, coves, and bays, so that no part of the island is 70 miles distant from the sea, most of it being much closer. The only other large island in the world, with a similar shape, is Japan. Compare the shape of Britain with that of India or Africa, where the coast is nearly everywhere one unbroken straight line. No country in the world (but Japan) is so well shaped as Great Britain is, both for inland trade and for commerce with other countries. The bays and wide mouths and estuaries of the rivers make numerous harbours all along the coast. In them, ships can lie safe and sheltered from stormy winds. Goods can be taken on board or landed safely and easily and cheaply, for the largest steamers can come close up to the banks.

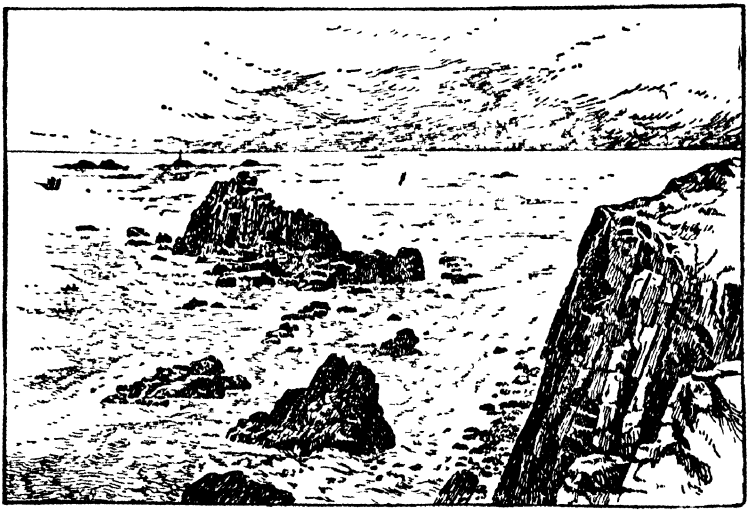


FIG. 51.—LAND'S END AND LONGSHIPS LIGHTHOUSE.

The great highway of commerce is now the Atlantic Ocean. The most important trade route in the world lies across this ocean, between America and Europe, through the English Channel, which is, so to speak, the gateway from the Atlantic Ocean into the North Sea and the countries round it. The British Isles lie directly in this route, and they have, therefore, the best situation in the world for the Atlantic trade. This may be seen clearly in Map 5, which shows the chief trade routes in the British Empire.

Moreover, a glance at the water and land hemispheres in Fig. 44 will show that London, the capital of the British Isles, is very nearly in the centre of the land hemisphere, including all the great countries of the world, except Australia. It is no wonder, therefore, that London is the largest and most important city in the world.

Great Britain is particularly well situated for trade with **Europe.** The mainland of the Continent lies opposite to it. Steamers from London can reach any of the ports on the coast of France, Holland, Belgium, Germany, or Denmark in a few hours.

Moreover, the long gentle slope of the land from west to east, which may be seen by the direction in which nearly all the rivers flow, is very favourable for trade with Europe. The mouths of these rivers open into the sea and form bays and harbours towards Europe, so that ships, large and small, can easily go to and fro between the east coast of England and the ports of Europe which lie opposite, across the North Sea. If the slope had been the other way, if the mountains of Great Britain and the scarp, or steep cliffs, had faced Europe, trade would not have been nearly so easy.

Also, the fact that Britain is an *island* with good ports and harbours all round the coast, makes trade with any country far easier than it could be, if it were, like Germany or Austria, in the middle of the Continent, with the sea on one small part only of its border. The carriage of goods by sea is much cheaper than carriage over land. And, as we have just seen, all the large manufacturing towns are within easy reach of some good seaport. For these reasons, the export of manufactured goods and the import of raw material and food costs comparatively little.

Map 4 shows, in colour, the physical features of the British Isles. It also shows the depths of the ocean. The blue colour all round the isles is the ocean. It is of a light tint. But at some distance from the west of Ireland the tint of blue becomes very dark. What does this mean?

The light blue shows shallow water, the dark blue shows deep water. The British Isles are *Continental islands*, that is to say, they once formed a part of the Continent of Europe. *Oceanic islands*, such as those in the Pacific Ocean, never formed part of any continent.

The islands, of which Great Britain is one, rise from a tract of land a few hundreds of miles broad, which now lies below the level of the sea. It was once much higher than it now is, so that the Continent of Europe included it and stretched farther westward than it now does. This tract of land is called the *Continental shelf.* It slopes gradually from a depth of 200 feet under the North Sea down to nearly 600 feet, about 50 miles from the west of Ireland, and then, at the edge of the shelf, there is a drop of thousands of feet down to the bottom of the Atlantic Ocean. On this shelf there stands a great plateau from which hills rise still higher. This plateau is Great Britain and Ireland. The North Sea, the English Channel, and the Irish Sea were formed by the sinking of the continental shelf to a depth of from 200 to 600 feet. The sea rushed into the hollows, but the plateau, *i.e.* the British Isles, stood high and dry above the level of the sea.

The shallowness of the sea is of very great benefit to Britain. In the first place, the *tides*, which make a wave only a foot or two high in mid-ocean, rise much higher when they reach the continental shelf. In the Bristol Channel, the difference between high and low tide is often 40 feet. The tides rush up the little bays and the mouths of the rivers and all the openings into the land. They cleanse the coasts, fill the docks, and enable large ships and steamers to go up the rivers far into the land. In the next place, fish swarm in shallow waters. In the North Sea there are banks which rise nearly to the surface of the water. The great **Dogger Bank** lies not far from the east coast of England. Here the sea is only 60 feet deep. It is one of the most valuable fishing grounds in the world. Millions of fish are caught here by thousands of fishermen.

Build of the Land.—In Map 4 the heights of the land, the mountains, the hills, and the plains are shown in different tints of colour, the plains and river valleys being in dark green.

These colours show that all the north-west of the island of Great Britain is a land of mountains, while all the south-east is a land of plains. There are, it is true, a few ranges of hills rising on the plains, but they are low.

There are three great masses of mountain in the island of Britain. The *first* is the northern half of Scotland and is known as the **Highlands**. These Highlands are divided into a northern and a southern part by the long straight narrow valley of **Glen More** (the Great Glen). The mountains in the northern half are the **North-West Highlands**; the southern are the **Grampian Highlands**. Below the Highlands there is a lower tract of land known as the **Central Lowlands**.

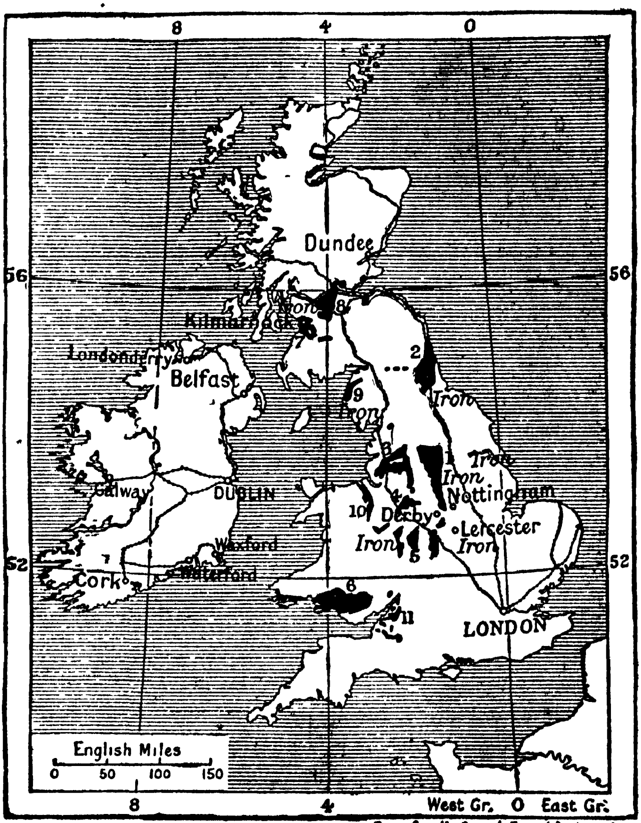
The *second* mountain mass is known as the **Southern Uplands**. They extend across Scotland from north-east to south-west, and stretch southwards into England where they are called the **Pennine Hills**, and, lower down, the **Lake District** mountains.

The *third* block of mountains is called the **Cambrian** or Welsh mountains, which cover all Wales.

All these uplands are great blocks of hard igneous rock. They are really plateaus with mountains rising on them. They are very different from the low ranges of chalk and limestone hills in the plains of England. These are seldom more than 1000 feet in height and run in long wooded ridges for many miles.

The *Watershed* of the island is a ridge not far from the western coast. The escarpment or steep side is on the west, and the long gentle slope towards the east. The whole island was upheaved, millions of years ago, and rose, as a plateau or great solid mass of rock, above the level of the ocean. Then the rain, the frost, the winds, and the rivers did their work for, say, a million years. All the softer parts of the rock were gradually worn away and washed down into the sea. The harder rocks, granite and metamorphic, still remain in ridges and blocks and peaks, and we call them mountains and highlands. Britain is therefore a *dissected plateau*. The highlands are not folded mountains like the Alps and Himalayas. The plains are still softer rock which was worn down to a lower level, and the hills upon them are made of chalk and limestone which, though not so hard as granite, are harder than the sandstone and gravel and clay around them.

One set or system of rocks below the soil of England is more



Stanford's Geog! Estab! London.

FIG. 52.—COAL- AND IRON-FIELDS OF GREAT BRITAIN.

valuable than all the rest. It is the Carboniferous rock, *i.e.* *Coal*. Fig. 52 shows where the great coal-fields of Britain lie. They are coloured black. On this map are also marked the places where iron is found. The iron mines are nearly all close to the coal mines. The iron is worked up in factories where the engines are fed by coal. If the two minerals were at a distance from each other, as is the case in some countries, it would be necessary to take the coal to the iron mines or to carry the iron to the coal mines, and this carriage would cost a good deal. All the cost of carriage is saved when the coal and the iron are found close to each other, as they are in Great Britain.

The *Climate* of the British Isles depends upon the factors described in Lesson 56. As to latitude, they lie in the North Temperate zone, between 50° and 58° N., nearer to the North Pole than to the equator. The altitude of the mountains in the north-west and west is from 2000 to 4000 feet; the plains slope gently eastwards to the sea-level. They are situated between the broad Atlantic on the west and the narrower North Sea on the east. Beyond this sea lies the vast continent of Eurasia, a wide expanse of land stretching away for thousands of miles to the far-off Pacific. The prevailing winds are westerly, from the ocean. The soil is poor on the hills but fertile on the plains, and always covered with green grass or grain. There is no sandy desert anywhere.

The effect of all these factors is seen in the climate, which is one of the healthiest in the world. It is mild and yet bracing. There are no extremes of great heat and intense cold. The variation is from cold to cool and from cool to warm. The warm westerly winds from the Atlantic make the climate much milder than that of many countries in the same latitude both in America and in Europe. The rainfall is much heavier in the west than in the east, for the mountains are in the west and the cold air on their summits condenses the moisture brought by the westerly winds into rain. The rainy season is in winter, but there is rain every month of the year, so that the country always looks green. It never looks parched and dry as the land so often does in India. The plains in the east are the driest part. There less than 30 inches fall in the year. In the plains near the base of the mountains, however, the rainfall is from 30 to 40 inches. The general rule is, that the rain is heavier as you go westward and lighter as you go eastward.

Agriculture.—On the hard rocks which form the mountains the soil is poor, the air is cold, and the winds are strong. Neither crops nor trees will grow, but on the slopes of the mountains there is always grass, on which flocks of sheep and cattle graze. The plains are, for the most part, fertile and highly cultivated. The chief grain crops are *oats*, *barley*, and *wheat*. But the population is so large that the grain is not nearly enough. Four-fifths of the wheat and flour used as food in Britain is imported from other countries, from Russia, Canada, the United States, India, Argentina, and Australia. The wheat-fields in England are all in the dry sunny plains of the south-east. Oats can grow in a cold damp climate. They are cultivated in Scotland and Ireland. *Turnips* and *potatoes* are other important crops. Potatoes grow chiefly in Ireland.

Minerals.—Coal is by far the most important mineral of Britain. The industries of the whole country are based upon the coal which works the engines in every factory. Coal began to be used for machinery a little more than a hundred years ago, when steam engines were invented. Then came railways and steamers which are run by coal. And in our days coal gas is made and used for lighting and heating houses. In the year 1800, nearly 10,000,000 tons of coal were raised. This amount had risen in 1920 to about 230,000,000. Most of the large towns in the country are found in the neighbourhood of the coal-fields. *Iron* is the next most important mineral. Then comes *Tin*, which is found in the south-west of England. *Lead*, *Copper*, and *Zinc* are found in many places. But the needs of the British manufactories are so great that a great deal of all these metals is imported from abroad. *Slate* is quarried chiefly in Wales, and used largely for the roofs of houses.

Government.—The government of the United Kingdom is styled a Limited Monarchy. The supreme authority rests in Parliament, which consists of (1) the Sovereign, (2) the House of Lords, (3) the House of Commons.

The Sovereign may be a King or a Queen according to certain rules of succession. Queen Victoria ruled for over sixty years. The present Sovereign is King George V. His full title is—

George V. by the grace of God King of the United Kingdom of Great Britain and Ireland, and of the

British Dominions beyond the Seas, Defender of the Faith, Emperor of India.

The House of Lords consists of Peers who hold their seats chiefly by hereditary right. There are 728 Peers in a full House.

The House of Commons includes 707 members who are elected by the people. Since the year 1911, every member has been entitled to a salary of £400 a year. Before that, members were unpaid.

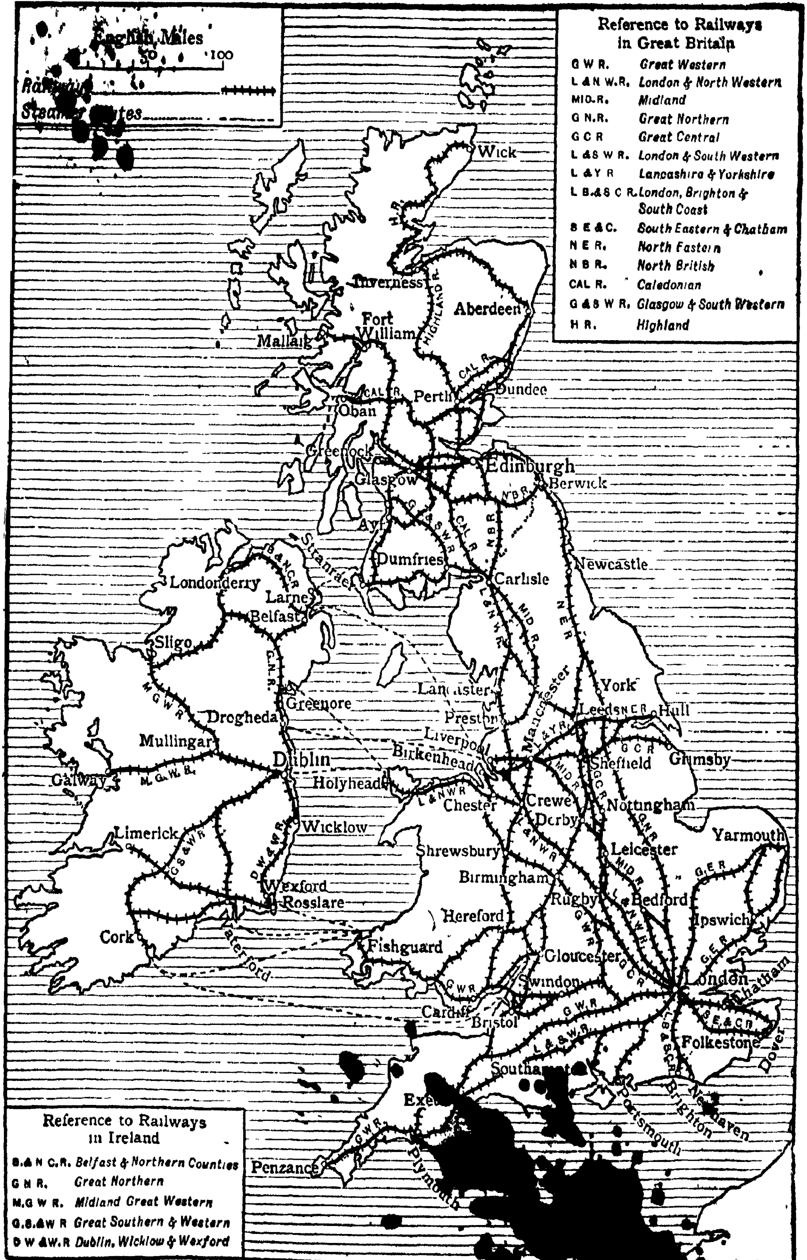
As a rule, a Parliament lasts for five years, after which there must be a fresh election. Formerly no law could be made without the consent of King, Lords, and Commons, styled the "three estates" of the Realm. Now, laws may be made in certain cases by the House of Commons, with the assent of the Sovereign, without the consent of the House of Lords. The House of Commons alone can propose money bills or impose taxes.

Men and women may vote for the election of a member of Parliament, and they must have certain qualifications. Nearly one-half of the population is entitled to vote.

The government of the country is practically conducted by a committee of the House of Commons styled the *Cabinet*. The members are appointed by the sovereign. There are twenty of these Cabinet Ministers, each of whom is the head of a department; they are all highly salaried officers. One has charge of the finances, another of military affairs, another of naval affairs, and so on. The head of the Cabinet is the Prime Minister.

The Parliament deals with Imperial measures, that is, with affairs of national importance. Local affairs are dealt with by Councils or Boards elected by the people. Each county in England has a County Council corresponding, more or less, to a District Board in India. A woman may be a County Councillor. These Councils levy rates and taxes and keep up roads, hospitals, schools, and so on. There are also Municipal Corporations in large towns, like the Municipal Boards in India.

Railways.—All parts of the British Isles are well provided with railways, as the map on p. 81 shows. In the margin



CHIEF RAILWAYS IN THE BRITISH ISLES

of the map the name of each railway is given. All railways in Great Britain lead to London. It is easy to reach London from nearly any part of the United Kingdom in 12 hours. Fast daily steamers go from Ireland to England, across the Irish Sea. They connect Holyhead in Anglesea, Fishguard in Wales, and Liverpool, with Dublin and Belfast, and other ports. These steamer routes are shown in the map.

Besides the railways above ground, there are many underground railways, particularly in London. Some of them run in "tubes" or tunnels, which are sometimes as much as 100 feet below the ground, and are worked by electricity (not by steam), so that there is no smoke. Passengers are taken down to them and carried up again, at the end of their journey, by "lifts." In London these trains run, as a rule, every three minutes.

TRADE AND COMMERCE.

The *Imports* are mainly of two kinds. Nearly half consists of food-stuffs, and more than one-third includes raw materials which are manufactured in England and exported as finished articles.

The *food-stuffs* are grain (chiefly wheat) and flour, seeds, meat, sugar; butter, cheese and eggs (termed dairy produce), tea and coffee, fruits and wine.

The chief *raw materials* imported are raw cotton, wool, wood and timber, metals and ores, rubber, leather hides and skins.

These imports come from all over the world, including the various countries within the British dominions, *e.g.* India, Canada, Australia, and Egypt; also from the United States, Germany, France, Russia, Argentina, Belgium, and Holland.

The *Exports* are nearly all manufactured goods and coal, and of the former, cotton goods far exceed all others.

The chief exports are cotton, woollen, and linen "piece-goods"; iron and steel [illegible] machinery; coal and fuel; chemicals, wearing [illegible] goods, hardware, and cutlery.

The [illegible] followed by steamers are shown in Map 5. The [illegible] given in the map. Some of the chief routes [illegible] in miles and the time usually occupied by ocean

London to	New York	3,000 miles	7 days
„	Buenos Aires	6,100 „	22 „
„	Cape Town	6,000 „	20 „
„	Bombay	6,600 „	20 „
„	Calcutta	8,200 „	33 „
„	Yokohama	11,600 „	52 „
„	Sydney	12,100 „	48 „
„	New Zealand	13,000 „	46 „

New Zealand is the antipodes to London, so that going to New Zealand means going half round the world. The opening of the Panama Canal has shortened all voyages to places on the Pacific Ocean, especially on the west coast of America, enormously. Passengers and mails to India often save a week of the journey to Bombay, by doing the first part of it overland by rail through France to Marseilles; they may save nearly two days more, by going by rail to Brindisi in the south of Italy and there taking a steamer to Port Said, where they meet the mail steamer from London to Bombay.

19. ENGLAND.

As we saw in a former lesson, the north-west of England is an upland, the south-east is lowland. In the north-west there are mountains, in the south-east there are plains. As is the case in India and everywhere else in the world, the plains are well populated, while few people live in the mountains and hills.

In the plains, the large manufacturing towns are close to the coal-fields. On the coast there are seaports, and in the interior, where there are no coal-fields, we find market-towns.

England may be divided into several smaller regions. They are: (1) the valley of the Thames and Southern England, (2) the South-western Peninsula, (3) the valley of the Severn and the Midlands, (4) the Eastern Counties, (5) Northern England.

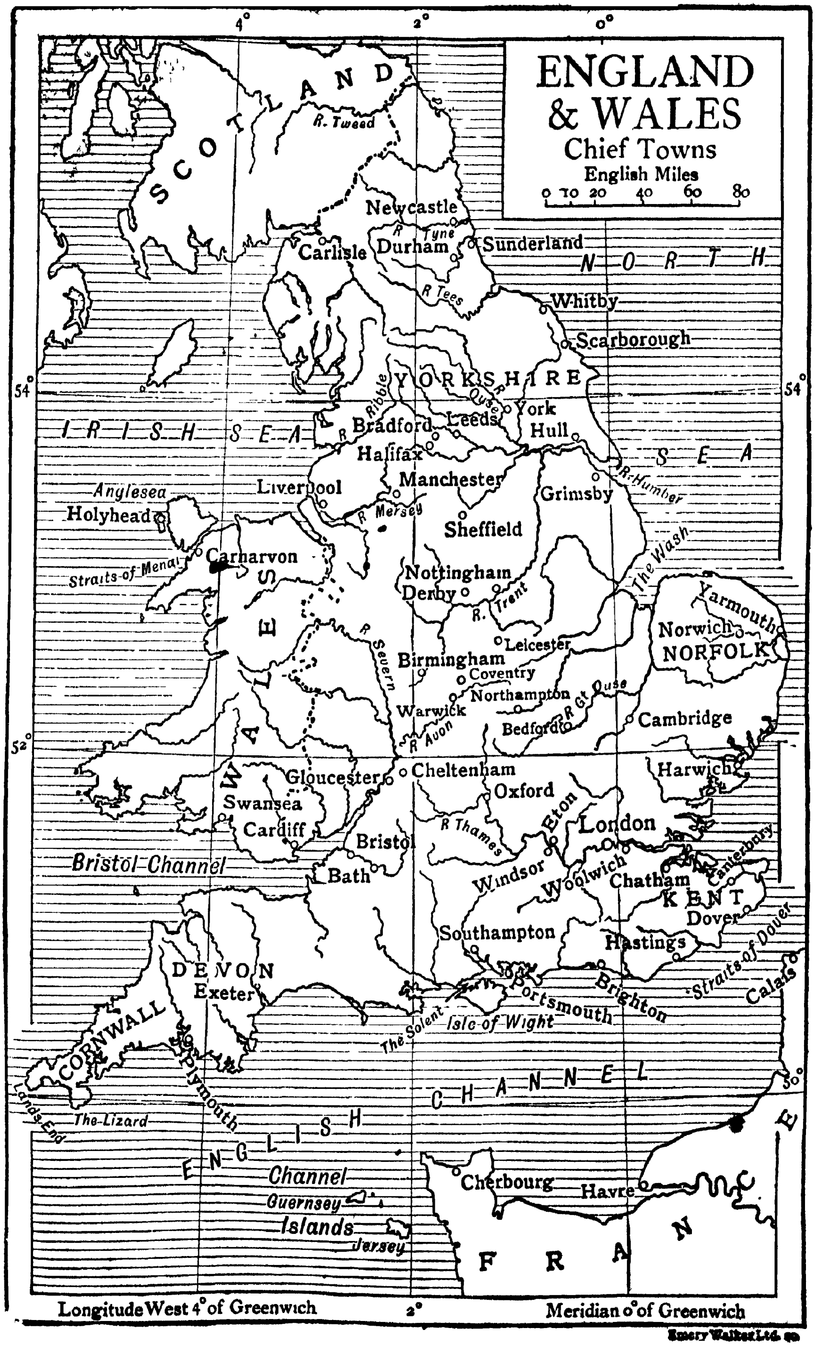
The Thames Valley and Southern England.—The Thames rises in the Cotswold Hills in the west of Southern England, and flows eastwards right across the whole width of the country. The basin of the Thames may be taken as the boundary which divides Southern England from the Midlands and the Severn valley. The wide plains, through which the river and its tributaries flow, are fertile and covered with fields of grain, while, in the rich pastures in the damp meadows close to the stream, cattle feed by the thousand. There are thick woods on the slopes of the hills, and from the timber articles of furniture, especially chairs, are made and exported. Kent, in the south-eastern corner, is called the "garden of England." It is famous for the growth of *hops*, which are used in making beer. There are also orchards of fruit trees. As the valley of the Thames is chiefly agricultural, there are many market-towns along the river, the largest being Oxford. Other towns are Windsor, Eton, and Harrow. There are many more.

The country to the south has many low ranges of chalk hills. The coast is lined with high cliffs of chalk. The towns in the south of England are in the river-valleys or on the coast. Here there are numerous watering-places, *e.g.* Brighton and Hastings; and seaports, *e.g.* Portsmouth and Southampton.

The **South-western Peninsula** includes the counties of Devon and Cornwall. Here there are many hills and high bleak moors, and great blocks of granite called *tors*. In these hills there are valuable minerals—tin, copper, and kaolin. For ages the mines in Cornwall supplied the world with *tin*. These mines, however, are nearly worked out. There is also a soft white clay, *kaolin*, out of which the fine china-ware called porcelain is made. It is sent to the potteries in Staffordshire.

The climate is the mildest in England, for this region is nearly an island. Frost and snow are seldom seen. Even palms grow in the open air. Invalids come here to stay for the winter. The chief industries are the rearing of cattle, dairy-farming, and fruit-growing. Devonshire is famous for cream and cider, a drink made from apples. There are good fisheries along the coast.

All the chief towns are at the mouths of rivers with estuaries that make good harbours, *e.g.* Plymouth. They are all drowned river-valleys, formed by the sinking of the coast in past ages.



Emery Walker Ltd. sc.

The men of Devon have always been good sailors and look on the sea as their home.

The Severn Valley.—The Severn is the longest river in England. With its tributary, the Avon, it drains a large tract of country in the Midlands and flows into the Bristol Channel. Its estuary is very wide at first and gets narrower as it goes inland. The tide rushes up with great force in a huge wave five or six feet high, known as the *Bore*. This makes it difficult for navigation, and therefore a canal has been made for ships to get to the river higher up, beyond the bore. In the valley of the Wye, a tributary of the Severn, sheltered from wind and rain by the mountains of Wales, there are rich gardens and orchards, from which thousands of tons of fruit are sent in the season all over England.

The **Midlands** are a plain in the centre of England, watered by the Avon and the Trent. In the villages, the rearing of cattle, dairy-farming, and the cultivation of the soil are the chief industries. But in the large towns there are many manufactures. This is because of the coal-fields. Fig. 52 shows that the chief coal-fields of England begin here. There are four different coal-fields in the Midlands, and around them the large towns are grouped. The materials that are manufactured are *clay*, *iron*, and *leather*, each in a different centre. Close to one field of coal there are thick beds of clay. Here pots of every sort and size are made, and cups, plates, dishes, and vessels of every kind. The district is known as the **Potteries**. Close to another large coal-field there are iron mines. This is the greatest iron-working district in Great Britain. It is called the **Black Country**, for the air is full of smoke and the ground is covered with coal-dust. Birmingham is the centre of the iron-working district, and there are dozens of towns like it. There is good pasture-land on the hills that border the Midlands, and here large flocks of sheep and cattle are reared. Their skins are made into leather, and close by there are large towns in which boots and shoes are made. Nottingham, Leicester, and Northampton are three of the largest of these towns. (Nottingham is more famous for lace.)

The Eastern Counties of England, Norfolk, Suffolk, and

Cambridge have no coal-fields, as Fig. 52 shows. There are therefore no large manufactures. The towns are either market-towns in the interior, or fishing towns and watering-places on the coast. The country is flat, and in former times there were many marshes and thick forests in it. It was known as the **Fens.** But the forests have been cut down and the land has been drained and now there are rich fields and pasture-lands. But there are still tracts under water called the **Broads,** the home of innumerable wild-fowl, for the water is full of fish.

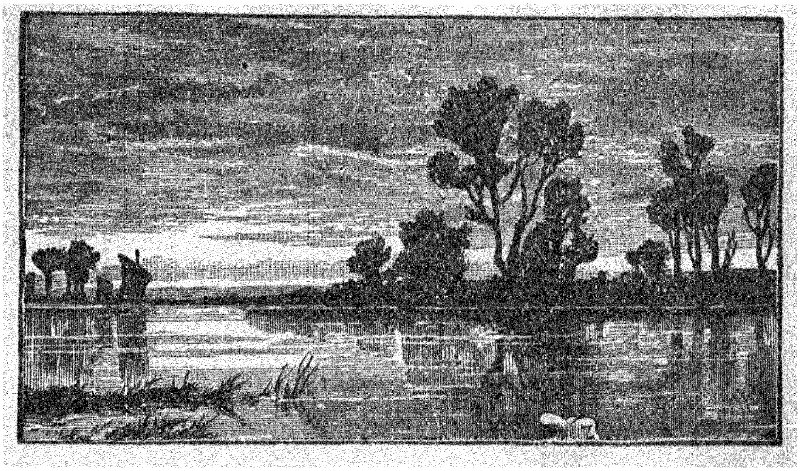


FIG. 53.—THE BROADS.

Here, in the summer, there are many visitors who come to fish and sail about in pleasure-boats.

These eastern counties are the most important agricultural region in England. The climate is dry and sunny and the soil is good. Wheat is grown everywhere, as well as barley and turnips. The fisheries on the east coast, where the great Dogger Bank lies opposite, are the most valuable in the country. **Yarmouth** and all the towns along the coast are full of fishermen. The fish is sent every day by rail to London and all over England.

Northern England includes the hilly tract on the west and the plains on the east. The Pennine Hills, and what is known as the **Lake District,** are the upland tract. The Pennines are a great plateau about 160 miles long and 30 broad. Out of it deep valleys have been "dissected" everywhere. There are great mountains over 3000 feet in height, the highest being the peaks of **Scafell**, **Helvellyn**, and **Skiddaw**. The lakes are very beautiful and many of them very deep. **Windermere** and **Ulleswater** are two of the finest. In the picture there are peaks called *Pikes*.

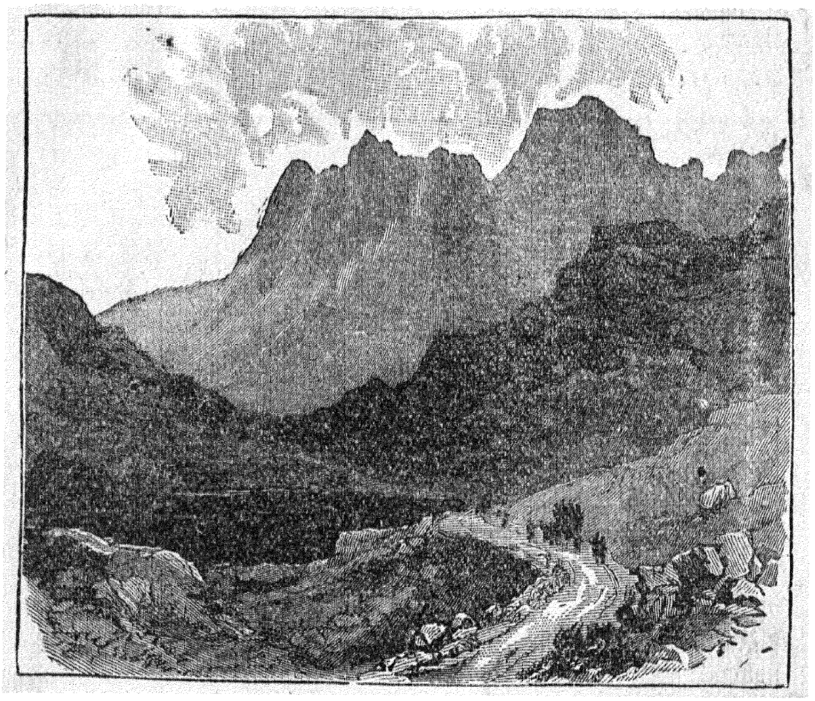


Fig. 54.—Langdale Pikes

The dale or valley is called Langdale. Compare this picture with that of the Broads and you see how different the west and the east of England look. Many people who love mountains and lakes visit this part of England in the summer.

On the east of the Pennines lie the great coal-fields of Yorkshire and Durham; on the west, those of Lancashire and Cumberland. In both regions we find large manufacturing towns filled with factories. *In the west*, in Lancashire, there are many large towns with a population of over 100,000, the largest being Manchester and Liverpool. The chief manufacture is cotton, which comes from the United States, Egypt, and India. *In the east* there is the great vale of Yorkshire watered by the Ouse and its tributaries. Here we find the largest coal-field in Britain and the richest iron mines. There is plenty of wool available from the large flocks which graze on the eastern slopes of the Pennines. The chief manufactures are therefore woollen goods and iron and steel ware. **Leeds** is the great centre of the woollen manufactures, and **Sheffield** is the great "steel town."

On the coast, fishing is the chief industry. The great ports of **Hull** and **Grimsby** receive as much fish as all the other ports of England put together. The River **Tyne** is the most important shipbuilding river in England as the Clyde is in Scotland. Its banks are crowded with busy industrial towns, of which Newcastle is the largest. On the banks of the River **Wear** much shipbuilding is also done; the chief town being **Sunderland.**

GREAT TOWNS IN ENGLAND.

(The population in thousands is given by the figures in brackets.)

London (7476), the capital of the British Isles and the heart of the British Empire, is the largest city in the world, being 15 miles across from east to west. In London proper there are 4½ millions of people, but including the suburbs, which really form parts of the town, there are 7¾ millions. This vast city forms a county by itself, with a population nearly equal to that of Ireland and Scotland put together and larger than that of several European countries. It is one of the oldest cities in Britain, for it was built on the River Thames more than 2000 years ago, before the Romans invaded the country. In old times there was low, marshy, swampy ground along both sides of the Thames from the sea up to the point where London now stands. Here the ground rises and the marshes ceased, so that the river could be forded, and here the ancient Britons had a stronghold called London which meant in their language "the Hill by the Swamp." The Romans made a road to it from the Straits of Dover and built a bridge over the river. All the traders from the continent of Europe crossed the English Channel in their ships at the narrowest part, which is the Straits of Dover. Then they landed at Dover and came on to London by the Roman road. This road and the River Thames made London a great trading town.

London stands at the point where the Thames can be bridged most easily. There are now many bridges over the river, thirteen road bridges and six railway bridges, besides three tunnels under the river from bank to bank. London has been built on both sides of the Thames, but the largest and grandest buildings are on the northern side. The east end nearest the sea is known as "the City." In it there are great banks, including the Bank of England, the strongest bank in the world There are also law courts and offices of every kind, hundreds of enormous warehouses, and thousands of shops, wholesale and retail. There are a great many churches, the largest being St. Paul's Cathedral, with its great dome rising 400 feet into the air.

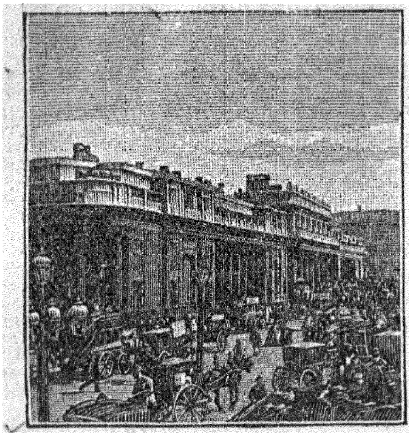


FIG 55 —BANK OF ENGLAND.

Lower down the river, near the great docks and wharves built for the ships and steamers that come up the river from the sea, there are huge factories and mills with their chimneys, smoking night and day, and great printing presses. Close to the river there is the Tower of London built 1000 years ago by William, Duke of Normandy, as a strong fort and palace for himself and a prison in which he

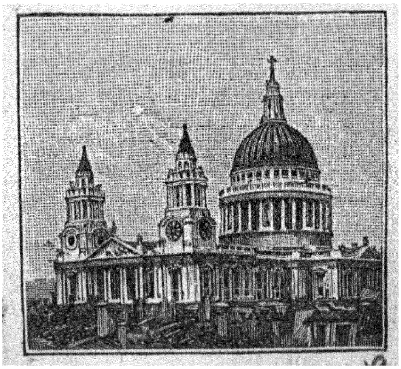


FIG. 56.—ST. PAUL'S CATHEDRAL.

kept his enemies. For hundreds of years it was the State prison of England. Many a prince and many a noble died in the Tower.

At the "West End" of London there are the palaces of the King, the mansions of the nobles, the houses of the wealthy, the residences of professional men, such as doctors and lawyers and architects, the offices of Government, civil and military, and the Houses of Parliament—the House of Lords and the House of Commons — on the bank of the Thames. Close to the Houses of Parliament there is the beautiful church called Westminster Abbey, *i.e.* the minster or church in the west, to distinguish it from St. Paul's Cathedral in the east. Here the greatest men of England lie buried. In the West End, too, there are great parks and squares and splendid shops and hotels and theatres and museums and libraries and art galleries. In the middle of this part of London there is Trafalgar Square. In the centre there is the Nelson monument, a pillar of granite 145 feet high with a statue of Nelson 16 feet high on the top of it. It commemorates the great naval victory of Trafalgar.

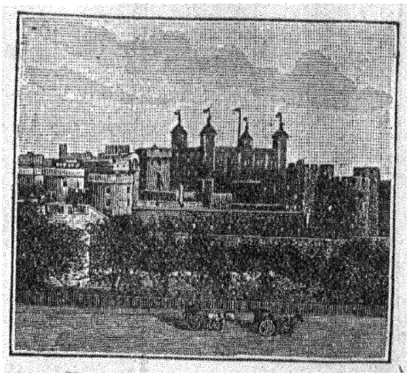


FIG. 57.—TOWER OF LONDON.

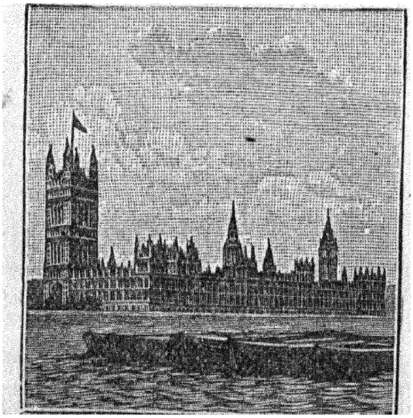


FIG. 58.—HOUSES OF PARLIAMENT.

London has more manufactures than any other city in the world. In its factories and workshops are made everything that can be wanted by civilised man. It is also the greatest seaport in the world. The tide runs up the Thames for 50 miles to London, where it rises from 13 to 20 feet, and great docks have been made, so that the largest ships and steamers can bring goods to it from all parts of the world and take from it manufactured articles to every country on the face of the globe. It has a famous University, on which the great Indian Universities have been modelled. There are numerous schools and colleges in London. There are many famous hospitals where students are trained to be doctors and surgeons. Many Indian doctors come from the London hospitals and have London University degrees.

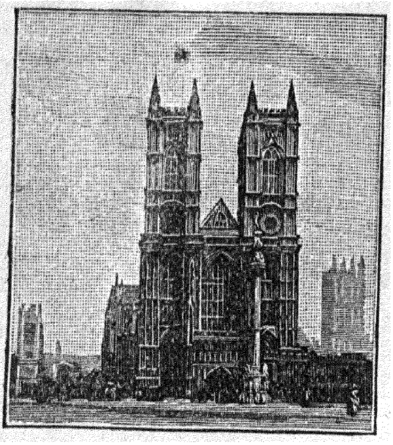
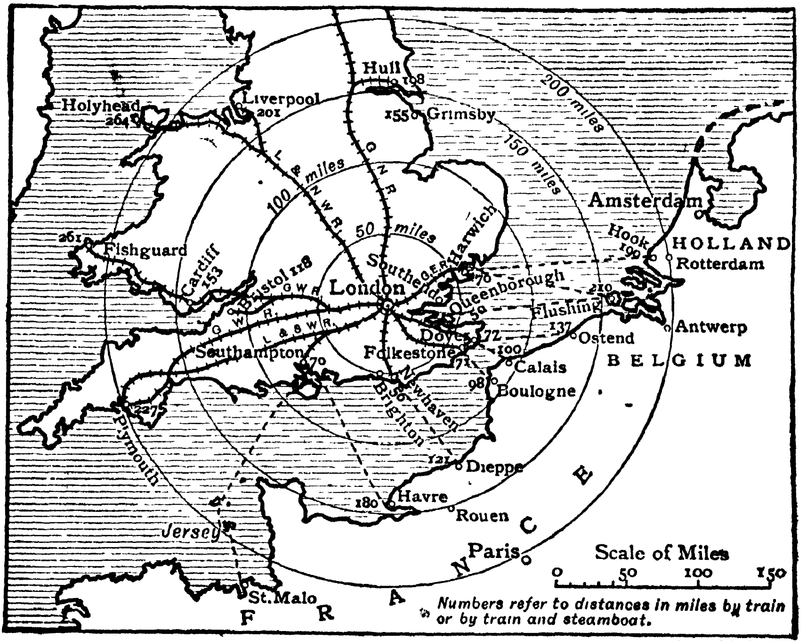


FIG. 59.—WESTMINSTER ABBEY.

London is the best instance we could have of a "Nodal town" (p. 333), as may be seen in Fig. 61. The Thames connects it with the sea, and numerous railways run from London to every part of England. The circles in the Figure show the distances in a straight line "as the crow flies," from London, at 50, 100, 150, and 200 miles. The numbers opposite certain places show the distances by rail, *e.g.* Plymouth is on the 200 miles outer line, but by rail it is 227 miles, for the railway, to avoid heights, does not always go in a straight line. The dotted lines in the Figure show the routes taken by steamers from ports on the south coast to seaports in France, Belgium, and Holland, which lie opposite to England, across the English Channel. The numbers show the total distance of each place from London, *e.g.* Calais is about 100 miles from London, including the railway in England and steam route across the Channel.

FIG. 60 —TRAFALGAR SQUARE.

Oxford (57) is one of the most interesting and beautiful towns in England. It stands on the Thames where the River Cherwell or Isis joins it. It is one of the largest market-towns in the Thames Valley. The University of Oxford is the oldest in England. It includes twenty-two colleges. The Bodleian Library in Oxford is one of the largest libraries in the world.



Emery Walker sc.

FIG. 61.—ROUTES FROM LONDON.

Eton, on the Thames, has the most famous of the great public schools of England. **Harrow**, also in the Thames Valley, not far from London, has another great public school, which rivals Eton. The sons of the nobility of England go chiefly to Eton or Harrow.

Woolwich (121) is on the Thames, not far from London. In it there is the Royal Arsenal,—a great factory in which thousands of men manufacture guns and shot and shell and other things wanted in the army and navy.

Chatham (42) stands on the estuary of the Thames below

Woolwich. It is a great naval centre and a strongly fortified seaport with one of the best dockyards in the world.

Canterbury (24) stands on the great highway, the old Roman

Fig 62.—The Quadrangle, Eton College.

road from Dover to London, where it crosses the River Stour. The Cathedral is the oldest in England and is very famous in English history. The Archbishop of Canterbury is, under the King, the Primate or Head of the Church of England.

Dover (40) is a great port in the south of England with a fine naval harbour. It stands on the Straits of Dover, the narrowest part of the sea dividing England from France. For ages this has been the point of crossing from Europe to England. Steamers go every day from Dover to Calais on the French coast. The distance is about 20 miles, and the crossing takes about an hour. On a clear day Calais can be seen from the white chalk cliffs of Dover.

Southampton (161) is the chief port on the south coast of England. It is very well placed for commerce, for it stands on the English Channel; and the busiest trade-route by sea in the world is that between New York in America and the English Channel. Most of the trade with South America and South Africa comes to Southampton. It is cheaper to land goods here than to take them the long way round by sea to London. It imports raw material and exports manufactured goods.

Portsmouth (247), on the south coast, is the chief naval station in Britain. It has a splendid harbour and is very strongly fortified. It has some very fine dockyards where ships are built and repaired, and many great storehouses.

Plymouth (210), on the south-western coast, has a magnificent harbour sheltered by a breakwater. It is a great naval station, with docks and workshops for the repair of ships. Passengers and mails from other countries for London are landed at Plymouth and are sent on by rail and thus save a day, while the steamers laden with heavy goods go round to London by sea. Opposite Plymouth, on a reef in the sea, there stands the well-known Eddystone Lighthouse for the guidance of sailors.

Gloucester (51) is a seaport at the mouth of the Severn. The trade is nearly all in imports of grain, timber, and sugar. There are scarcely any exports. Gloucester, being on the estuary of the Severn—the largest river in England, and a waterway into the heart of the country—ought to be a great port like London or Liverpool. But it never has been a great port because of the difficulty to navigation caused by the *Bore*, described in connection with the Severn (see p. 86).

Bath (69) is a very popular inland watering-place on the

River Avon. The Romans built baths here which are still in use, for the hot springs of the district are health-giving. The climate is mild and the country around very pretty.

Bristol (377), on the estuary of the Severn, is one of the oldest seaports in Britain and was for a long time the biggest next to London. A great deal of the Atlantic trade came to it as it was the nearest port with a good harbour on the western coast, and from it there are good roads and river-routes by the Severn and its tributaries into the south-east of England. There is still much trade with Bristol from Ireland and America. Tobacco and raw cocoa are imported and made up. The West Indies and Central America send sugar, millions of bananas or plantains, and pineapples.

Cheltenham (48) is another well-known inland watering-place with hot springs like those of Bath. The water of these springs is drunk by invalids. The climate is mild. There is a good public school. Many old Indian officers live in Cheltenham.

Birmingham (919), often called the "Capital of the midland counties" of England, is the fifth largest city in the British Isles. It is close to the large coal-fields and iron-mines of Staffordshire. It is in the heart of the country, a long way from any large seaport, and therefore the goods made in Birmingham are not rough and heavy and such as cost a good deal to carry by rail, but finished articles of which the cost of workmanship is high, and which are valuable enough to pay for carriage by rail. All kinds of hardware goods of iron, steel, brass, and copper are made in Birmingham—"from a pin to a railway engine." Costly jewellery, some of the finest in Europe, is also manufactured out of silver and gold. Besides these, there are large manufactures of guns, swords, cycles, railway engines and carriages, steel pens, and buttons, screws, pins, and needles, and tools. There is a great University.

Coventry (128), on the Avon, has to get its coal from a distance and therefore manufactures only valuable articles which can pay for the carriage of coal. It is now the chief seat of the bicycle and motor-car industries. Ribbons and watches are also largely made.

Nottingham (263), on the River Trent, is a large town in the Midlands, in the centre of a sheep-rearing country. There is a coal-field not far off. Hose and lace are the chief industries. There are also factories for the making of bicycles and motor-cars.

Leicester (234) and **Northampton** (91) are both in the valley of the Trent, where there are well-watered grass-lands on which herds of cattle and large flocks of sheep graze. There is therefore plenty of wool available from the sheep, and hides are obtained from the cattle. In these towns, boots and shoes and woollen hose and lace are manufactured. There is a coal-field close by, from which the manufacturers get coal for their factories.

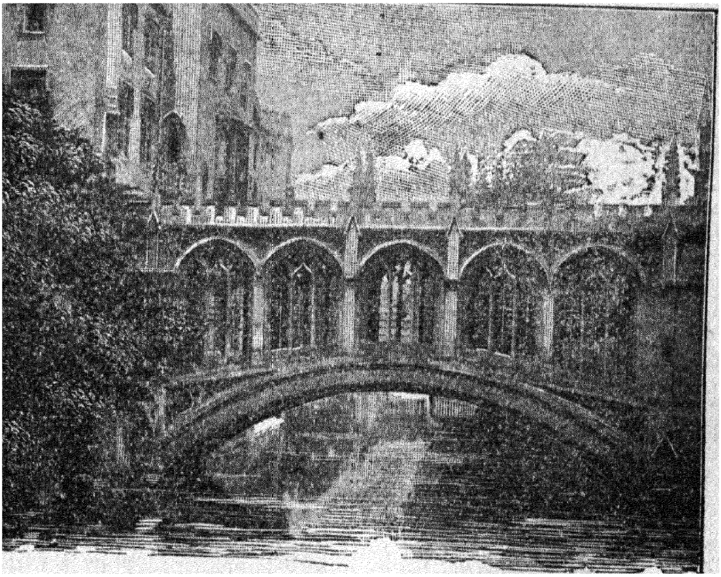


FIG. 63.—BRIDGE OF SIGHS, ST. JOHN'S COLLEGE, CAMBRIDGE. Photo. J. Noaks.

Cambridge (59), in the east of England, is built on the little River Cam, which flows through it. It is a large market-town. It is in the centre of the "fen country," which in ancient times was covered with marshes which could only be crossed at this point by the bridge over the Cam, hence called Cam-bridge. In the town is one of the two great ancient Universities of England.

Like Oxford, the other ancient University, it has many old colleges with beautiful buildings and halls and libraries.

Yarmouth (56), at the mouth of the little River Yare, is a seaport on the eastern coast, and a fishing town It is the chief seat of the herring fishery. The herrings are caught by fishermen in boats. They use "drift nets," which lie on the surface of the sea and are fastened together, and are sometimes a mile in length. Often a million herrings are caught in a day. It is also a watering-place to which many people go for a time in summer to bathe in the sea.

Grimsby (82), on the coast of Lincoln, at the mouth of the Humber, is the most important fishing town on the whole eastern coast. In the North Sea, opposite, there is the great Dogger Bank, where fishes swarm. Thousands of fishermen go out in small steamboats called "trawlers," because they drag great nets called trawls along the bottom of the sea to catch flat fish which live on the sea-floor. The fish are sent by rail to London and other large towns every day by train. Grimsby is also a great trading port with large exports and imports. It is the sixth seaport in England.

Manchester (730), in the north-west of England, is the centre of the cotton industry. Within 20 miles there are seven other towns, each with a population of over 100,000, and dozens of smaller towns all engaged in the cotton trade. If Salford, a suburb of Manchester, be included, there are about a million of people in it.

Although Manchester is not on the sea, it is a seaport town, the fourth in rank among British seaports. This is because ot a great ship-canal that has been made between Manchester and Liverpool, so that large ships and steamers, which come to Liverpool with goods for Manchester, do not stop there, but sail on through the canal to Manchester and land their cargoes there. Lines of railway also connect the two towns.

Three-fourths of the raw cotton comes from the United States. The rest comes from Egypt and India, three times as much from Egypt as from India. The raw cotton is brought to Manchester, and the goods made up in the other towns close by, are sold in

Manchester, and stored in large warehouses by the merchants who buy them from the manufacturers and export them all over the world.

There are three reasons why these large towns have become seats of the cotton industry. Close by there are the rich coal-fields of Lancashire, and they supply all the coal wanted for the factories. The climate is moist. In a dry climate the cotton threads break easily, and it is hard to spin them or weave them into cloth. And when the goods are made, there are seaports near, so that the carriage of the goods to other countries costs less than carriage over long distances by rail.

Liverpool (803), on the estuary of the Mersey, ranks next to London in importance as a seaport. Its trade is mainly with America. It has 25 miles of quays or landing-places for goods, and in its splendid harbour there are hundreds of ships from every part of the world. Great steamers sail daily for North and South America and other countries. The cotton trade has made Liverpool the great port that it now is. It is the starting-point of the great ocean "liners" to America, and many other parts of the world.

Leeds (458) and **Bradford** (286) are the largest towns in the north-east of England. They are in the West Riding of Yorkshire, which is the home of the *woollen* industry. Leeds is the sixth largest town in England. In both towns, there are huge factories and mills for spinning and weaving wool. The woollen manufacture began in this part of the country long ago, because there is always plenty of wool to be had from the sheep which graze on the grass-lands in the country around. The mills were worked by water from the streams that flow down from the Pennine hills. When steam-engines were invented, the industry flourished still more, for there is excellent coal close by in the rich Yorkshire coal-fields. Very soon the wool of the country was not enough to feed the mills, and millions of pounds of wool are now imported. In 1911 there were about 500 millions imported from Australia and New Zealand, and 100 millions from South Africa. The wool comes to London, and is sent thence to Yorkshire. Of late years the iron and steel works in Leeds have become as important as the woollen mills. In Bradford, velvet is a special industry, besides woollen goods.

Halifax (99), in the West Riding of Yorkshire, is one of the chief seats of the woollen manufacture. Here more woollen carpets are made than in any other town in the world, as well as blankets and iron goods.

Sheffield (491), the fifth city in England for size, is the chief seat of steel manufactures, chiefly cutlery. In the neighbourhood, good grindstones are found, on which the cutlery is sharpened, and, as in Leeds, the streams running down from the Pennine mountains were at first used to turn the mills, but steam-engines are now worked by the coal from the Yorkshire coal-field. Everything that can be made from steel is made in Sheffield—steel rails, engines, guns, steel plates, machinery, and knives of every sort.

York (84) stands on the River Ouse, in the middle of the broad Vale, or Plain, of York, where many routes meet. It is now a great railway centre. Under its ancient name, Eboracum, it was the capital of Roman England. It is the chief town of Yorkshire, and the largest market-town in the valley of the Ouse. It has a splendid cathedral, called York Minster. The Archbishop of York stands next to the Archbishop of Canterbury in rank in the Church of England.

Hull (278), on the Humber, is by far the largest seaport in north-eastern England. It comes next to Liverpool, being the third seaport in Britain. Ships from the Humber export the woollen goods of Yorkshire and the cotton goods of Lancashire to all the countries of western Europe. It is also a great fishing port, coming next to Grimsby in the fish trade. It also imports large quantities of oil-seeds, and is the chief seat in England for crushing oil-seeds for oil. It imports timber from Norway, butter from Denmark, and iron-ore from Sweden and Belgium. It has large shipbuilding yards and rope and sail works.

Newcastle (275) is a seaport on the River Tyne, 8 miles from its mouth. It was built by William the Conqueror, about 1000 years ago, at the nearest point to the sea, where the Tyne could be crossed. He called it his *new castle.* Along the estuary of the Tyne, on both sides, there are great shipbuilding towns right up to Tynemouth, where the river falls into the sea. Newcastle is in the centre of one of the largest coal-fields in England, and its chief export is coal. It has also large factories in which railway and steam-engines are made, and chemicals and glass.

Durham (18), on the River Wear, is the seat of a University and has a fine old cathedral. There are manufactures of carpets, and iron and brass foundries. There is a great coal-field close by.

20. SCOTLAND.

SCOTLAND, as may be seen in Map 4, consists of three parts. They are: (1) the Highlands, (2) the Central Lowlands, (3) the Southern Uplands.

The **Highlands**, known in ancient times as Caledonia, are divided into two parts by the long, narrow, straight valley of Glen More. Along this deep rift, which contains three narrow lakes, the Caledonian Canal has been made, to allow a passage for vessels sailing from the North Sea on the east of Scotland to the Atlantic on the west. It is not used much, however, because there are no large towns close to it. The mountains on the north are the North-West Highlands. Those on the south are the Grampian Highlands. The highest peak in Scotland and in the whole island is **Ben Nevis**, 4400 feet. The chief industry is sheep-rearing. Scarcely any crops can be grown because of the poor soil, and the wet and sunless climate. The farmers are called *crofters* and their little farms are *crofts*. In the sheltered valleys oats and potatoes are grown with difficulty.

The **Central Lowlands** are the midland valley of Scotland. On these lowlands rise several groups and ranges of hills about 2000 feet high, the chief of which are the **Pentland Hills**, south-west of Edinburgh. They are volcanic, and are made of lava, poured out ages ago by volcanoes of which no trace can now be seen. In the valleys between these hills flow the Rivers Tay, Forth, and Clyde. There is a rich coal-field (see Fig. 52) in the

Lowlands, and this has made it a great manufacturing centre. Large towns have arisen, filled with factories, the chief being Glasgow, Paisley, Greenock, and Dumbarton. These towns lie along the Clyde. The valley of the Clyde is the most important part of Scotland, for about a half of the population of the whole country is settled there. The banks of the Clyde are lined with shipbuilding towns. More ships are built here than anywhere else in the world. Grain, especially wheat, is largely grown in the county of Fife, in the *east* of the Lowlands, and in the "Lothians," the country all round Edinburgh. Here there are broad valleys and coastal plains, and the climate is warmer than in the western counties, where dairy-farming is the chief occupation of the farmers. In the *west* there is pasture-land for cattle. The milk from these farms is taken by railway as far south as London.

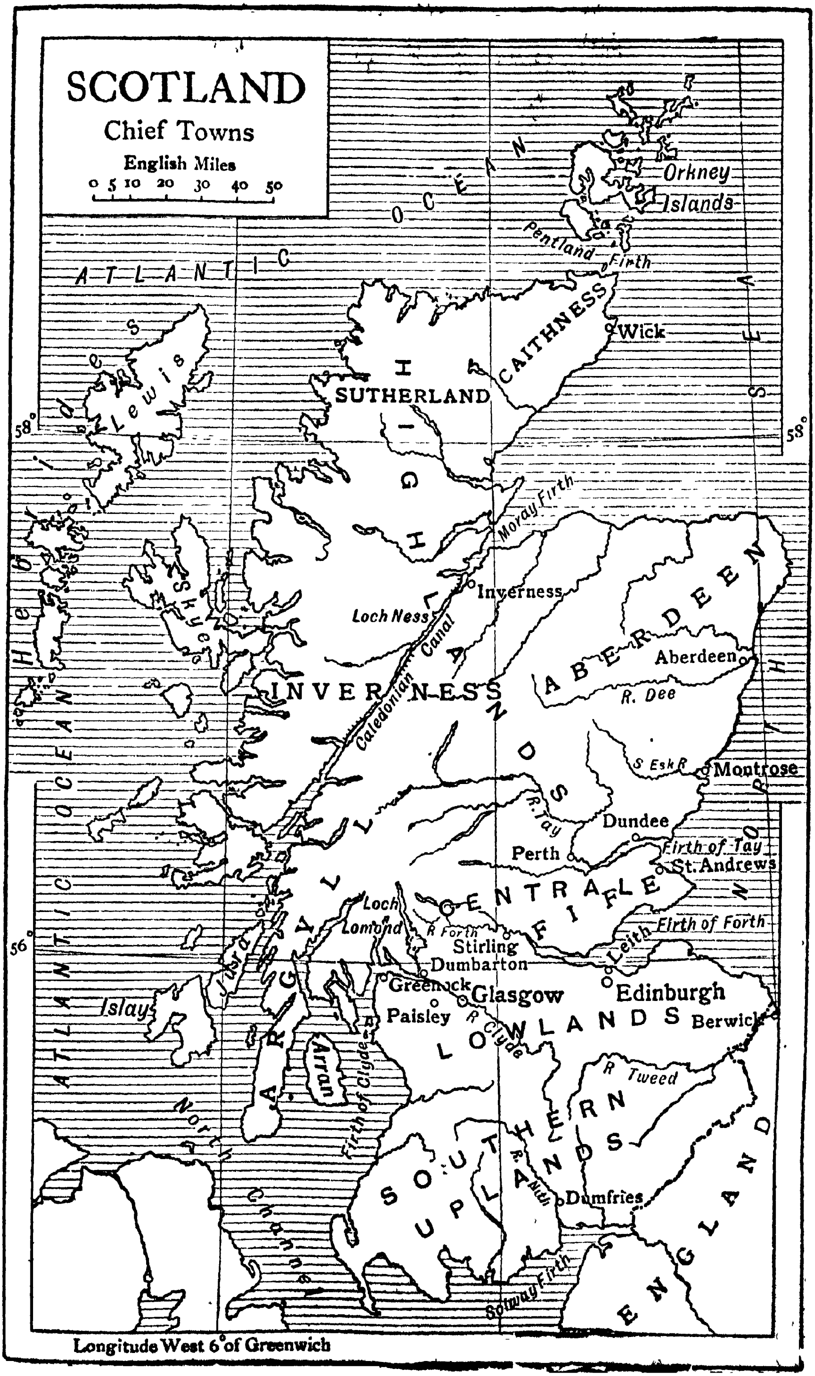
The valleys of the rivers form gaps through the ranges of hills and lead into the Highlands to the north. In each gap there is a large town. In the Tay gap there is Perth, in the Forth gap there is Stirling, and in the Clyde gap there is Dumbarton. These towns were strong forts in former days, built by Scottish chiefs to command the roads through the gaps. A railway now goes through each gap.

The **Southern Uplands** are the northern part of a hilly tract of land that stretches southward into England. It is known as the **Cheviot Hills** on the border between the two countries, and as the **Pennine Range** in the north of England. The hills in the Southern Uplands are a little under 3000 feet in height.

In former times when Scotland was a different country from England and had its own kings, this upland tract was a strong defensive barrier between England on the south and the populous Lowlands on the north. It kept Scotland safe from invasion.

The chief rivers are the **Clyde**, the **Tweed**, and the **Nith** The Clyde rises in the centre of the Southern Uplands. As it passes from the Uplands to the Lowlands on the north, it forms beautiful waterfalls. The most important part of the Clyde is its middle and lower course where it flows through the Lowlands.

There is no coal-field in this region and therefore there are no very large manufacturing towns. The plains and broad valleys on


SCOTLAND
Chief Towns
English Miles
0 5 10 20 30 40 50
ATLANTIC OCEAN
Orkney Islands
Pentland Firth
CAITHNESS
Wick
NORTH SEA
Hebrides
Lewis
Skye
HIGHLANDS
SUTHERLAND
Moray Firth
Inverness
Loch Ness
Caledonian Canal
INVERNESS
ABERDEEN
Aberdeen
R. Dee
S. Esk R.
Montrose
R. Tay
Dundee
Perth
Firth of Tay
St. Andrews
ARGYLL
CENTRAL
FIFE
Loch Lomond
R. Forth
Stirling
Leith
Firth of Forth
Dumbarton
Greenock
Glasgow
Edinburgh
Paisley
R. Clyde
LOWLANDS
Berwick
Jura
Islay
Arran
Firth of Clyde
North Channel
R. Tweed
SOUTHERN UPLANDS
R. Nith
Dumfries
Solway Firth
ENGLAND
58°
56°
Longitude West 6° of Greenwich

the *east*, watered by the River Tweed, are well suited for agriculture, for they are warm and sunny, compared with the hilly country in the west. In the *west* there are rich pasture-lands and sheep-rearing is the chief industry. The chief manufacture, therefore, is the making of *woollen* goods, but as coal has to be brought from a distance, the industry is not so important here as it is in Yorkshire where there is a great coal-field close by.

CHIEF TOWNS IN SCOTLAND.

(The population in thousands is given by the figures in brackets.)

Inverness (22), a seaport on the River Ness, near its mouth, was once a very important town, because it guarded many routes leading to the Highlands, which crossed one another at this point. It is still considered to be the capital of the Highlands. It stands at the northern end of the Caledonian Canal. All trade must pass through it, but the trade is small because the country is thinly populated.

Aberdeen (159), a seaport on the North Sea, is by far the largest city and the chief fishing station on the north-eastern coast. It stands between the mouths of the little Rivers Dee and Don, in a passage where the Highland mountains come down close to the sea, so that all traffic along the coast must pass close to it. In the town, there are factories for cutting into blocks the granite found in the hills close by. These blocks are shipped to other places. There are also shipbuilding yards, ironworks, and flax and jute manufactures. There is a famous University. Professors with Aberdeen degrees are well known in colleges in India.

Wick (9) is the chief fishing town in the far north-eastern county of Caithness, on the coastal plain below the Highlands. The people in this part of the country are bold and skilful sailors, and fish in stormy seas on a rough and rock-bound coast. In the picture we see the huge cliffs on the coast. The stratified rock shows that they once lay at the bottom of the ocean. The waves, dashing on the shore for ages, have washed out the softer rock, and will in time wear down the rocky pillars that remain.

Glasgow (1034), the greatest manufacturing town in Scotland, is the largest city in the British Isles except London. It has a good port, and stands on the River Clyde at the nearest point to the sea where it can be bridged. It is a great railway junction, and all the traffic from the east and the west passes through it. Engines of all kinds, especially railway engines, are made here; indeed more locomotive engines are built in Glasgow than in any other town in Europe. There are enormous iron-foundries, and factories for making cotton goods, carpets, lace, and paper. There are also huge shipbuilding yards. This great town has been made what it is by its situation for trade, and by the rich coal-fields and iron-mines close to it. It is the seat of an ancient University. The building of great iron ships and steamers is carried on, for 20 miles along the Clyde below Glasgow, in many towns, the chief of which are **Greenock** (75) and **Dumbarton** (22).

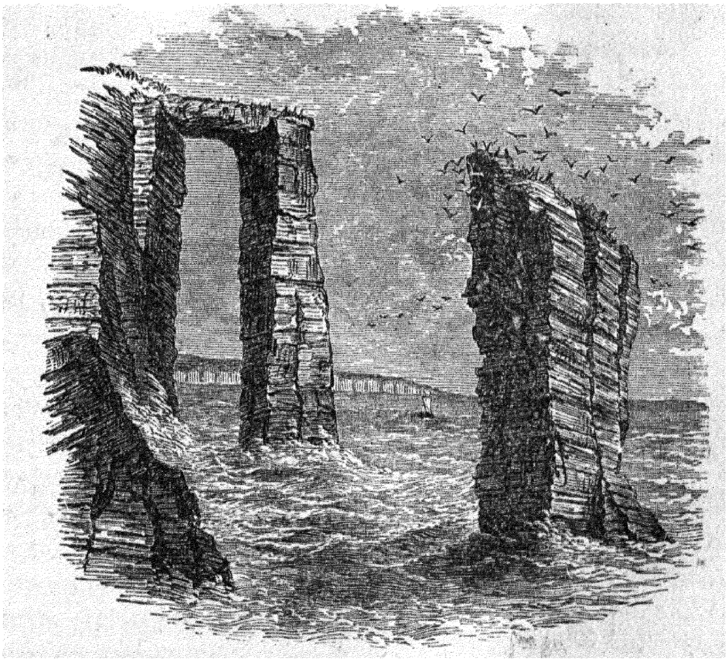


FIG 64.—SCENE ON THE COAST OF CAITHNESS.

Paisley (85), a very large town about 7 miles from Glasgow, has the largest cotton-thread mills in the world. There are also large manufactures of machine tools. As the town is at some little distance from the iron and coal-mines, the men of Paisley do not make large quantities of low-priced iron and steel goods, which are so heavy that they do not pay for their carriage. They manufacture costly machine tools, for which the charge for carriage is small, compared with the price.

Perth (33), on the River Tay, is an ancient town famous in Scottish history, for it commands two great routes. It stands on the old road along the east coast of Scotland to Dundee and Aberdeen, and also on the route by the valley of the Tay into the heart of the Highlands. It now has large bleaching and dyeing works.

Edinburgh (420), on the Firth of Forth, about 400 miles north of London, was the capital of Scotland before the Union, and is still regarded as the capital. It is the chief town in the east of Scotland, as Glasgow is the chief town in the west. It is one of the most beautiful cities in Britain, and has been called the Modern Athens, for, like that famous city, it is built on several low hills; and on a steep rock in the centre of the town stands the citadel or castle of Edinburgh. It is a "gap town," i.e. it stands in the gap or narrow strip of land between the Pentland Hills and the sea, so that all the traffic along the east coast must pass through it. It is a great railway centre. Edinburgh Castle, built 1200 years ago by Edwin, King of Northumbria, after whom it was named, commanded this route in ancient times. The University of Edinburgh is celebrated, especially for its medical schools and degrees. Many a doctor in India has an Edinburgh degree. Paper-making, printing, and publishing are flourishing trades.

Leith (80) is the port of Edinburgh and reaches up to it. It is sixth in size, of Scottish towns, and ranks next in importance to Glasgow as a seaport. Its ships trade with the ports of Europe on the North Sea and the Baltic. In Leith, ships are built; and sails and ropes and everything wanted by sailors are

St. Andrews (8), though a small town, has the oldest University in Scotland. It has become famous of late years for its "golf-links," which are the best known in the world.

Dundee (168), the third largest city in Scotland, is a seaport which stands close to the famous Tay Bridge, over which the railway runs for two miles over the arm of the sea known as the Firth of Tay. It is the chief seat of the manufacture of jute, which comes from Bengal. Out of it are made sacks and ropes and millions of coloured "prayer carpets" for Muhammadan countries. There is also a large import of flax from the Baltic seaports, which is made up into linen goods. There are many jam factories, for fruit is abundant and cheap. Ships are built in the docks on the Tay and small steamers.

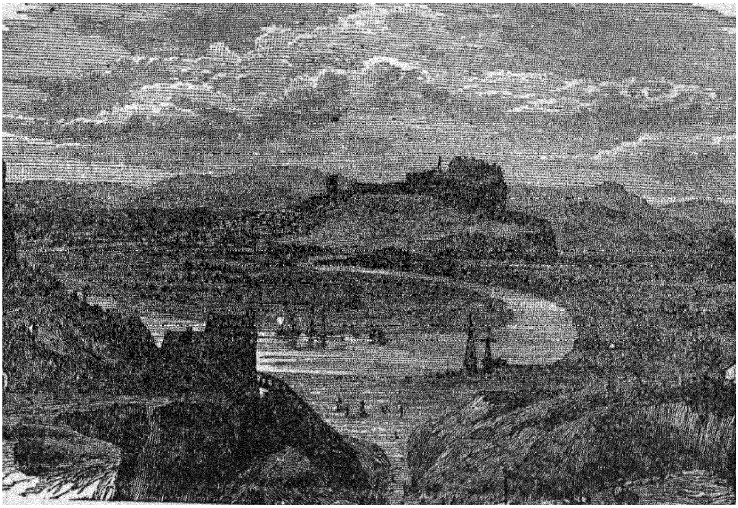


FIG. 65.—STIRLING AND RIVER FORTH.

Stirling (21), on the River Forth, is a "gap" town, with an ancient castle built on a great rock or droog that rises out of the plain, and commands the route into the Highlands, by the valley of the Forth, from the Lowlands. Here the famous Battle of Bannockburn was fought, which made Scotland independent, in the year 1314. Stirling is now an important railway junction, and has manufactures of woollen goods, chiefly blankets and carpets.

21. WALES.

WALES is a land of mountains and valleys. There are no plains in it. It is a dissected plateau, the summit of which was once at least 4000 feet above the sea-level. The valleys have been carved out of it by the rain and the rivers, the frost and the wind. The hardest rocks remain as mountains. The highest peak is **Snowdon**, 3600 feet high.

The rainfall on the Welsh mountains is very heavy. Around Snowdon, it is over 100 inches in the year. Some of the lakes have been made into great tanks or reservoirs, in which the rain-water is stored up and carried down by large pipes to supply great cities at a distance. Liverpool and Birmingham both get their water in this way.

The chief industries in **North Wales** and **Central Wales** are sheep-rearing and slate-quarrying. The slopes of the hill valleys afford good pasturage for sheep. There are more sheep in Wales for the size of the country than in England or Scotland. If there were coal close by, there would be a large woollen industry. The slates of North Wales are the finest in the British Isles.

All round the coast there are little watering-places to which visitors go for a month or two in summer.

South Wales has a very fine coal-field, one of the best in Britain. It is the only part of the country in which there are large manufacturing towns. Iron is also found, but not nearly enough for the great factories in Swansea.

CHIEF TOWNS IN WALES.

(The population in thousands is given by the figures in brackets.)

Swansea (158), at the mouth of the little River Tawe, is the chief seat in Britain of the metal-smelting industry. Enormous quantities of. articles are made from tin-plate, *i.e.* thin sheets of iron, coated with tin to keep the iron from rusting. This is done by dipping them in melted tin. This tinned iron is used for making "tins," in which preserved food of all kinds is put. In India, this tin-plate is well known from the cans of kerosene oil which are made out of it, and sold in every bazaar. Copper is also melted and refined in Swansea. The making of tin-plate began here because the town stood midway between the copper and tin mines of Cornwall and Devon and the coal-field of South Wales. But most of the tin now comes from the East Indies, and most of the copper from Spain, for the Cornish tin mines are nearly worked out.

Cardiff (200), at the mouth of the little River Taff, is the chief port for the export of coal. Close by, there is the coal-field of South Wales, in which there is the best coal in the world for steamers and railways, for it is smokeless. The British navy uses this coal. The coal comes down to Cardiff, by canals and railways, by day and by night. It is taken straight to the great docks in the harbour, and then put on board the steamers. More coal is exported from Cardiff than from any other town in the world.

Carnarvon (9) has a fine old Norman castle built by Edward I. In it the first Prince of Wales was born.

22. IRELAND.

IRELAND includes a central plain with mountains all round it These mountains are in groups with wide gaps between them rather than in long ranges. Therefore the mountains in the north, south, east and west of Ireland do not shut out the winds from the ocean. They blow through the gaps, right across the plain. The whole country has a maritime climate. The grass is always green, so that Ireland has been called the "Emerald Isle."

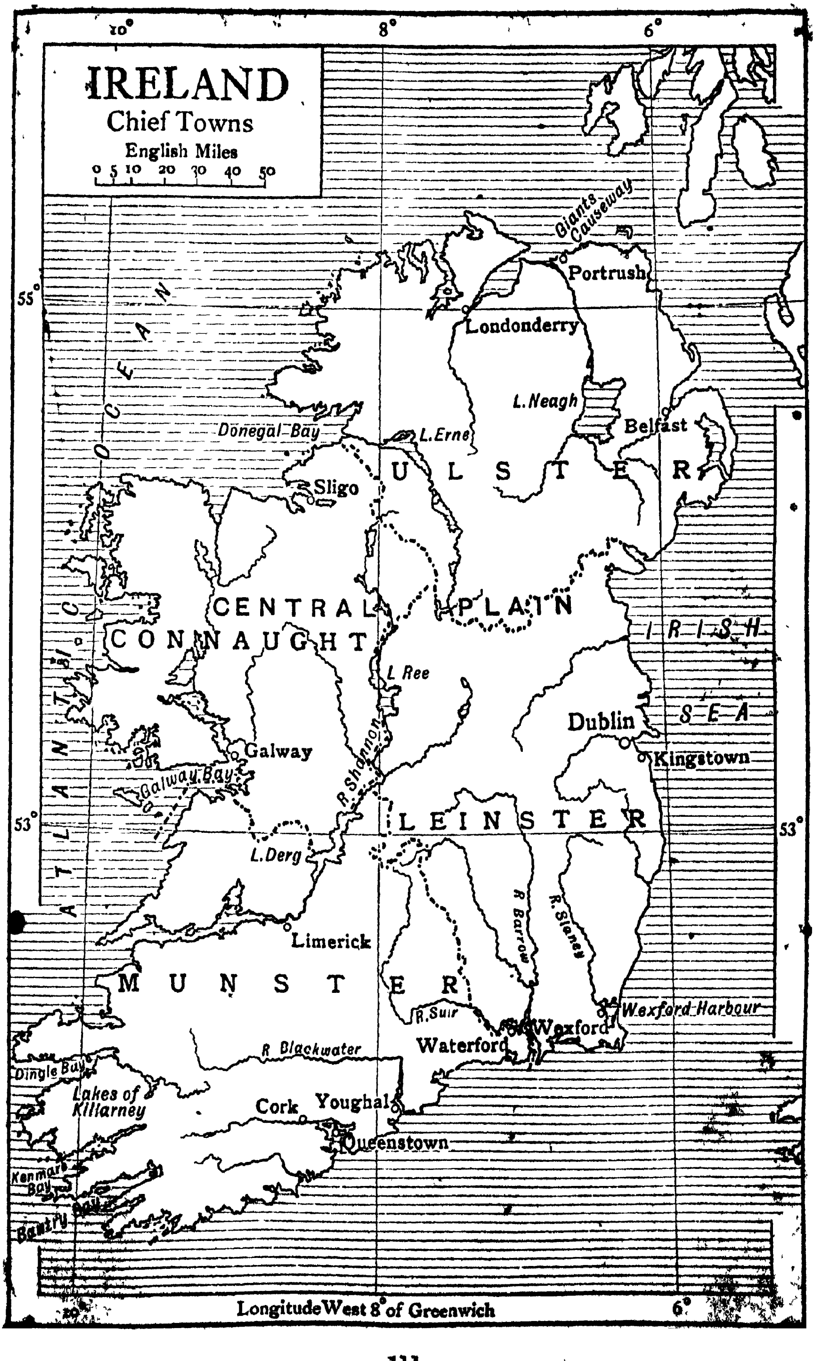
The rainfall is moderate and spread evenly all over the country, the average being about 40 inches in the year. It rises to 60 inches on the western hills. All the central plain is well-watered grass-land, some of it being marshy, with peat bogs. About one-sixth of the land is cultivated, oats and potatoes being the chief crops. Flax is grown in the north-east in the province of Ulster.

The rearing of sheep, cattle, and pigs is the chief industry of the Irish farmers. Five-sixths of the land is rich pasture, which supports large flocks of sheep and herds of cattle. Great quantities of butter, cheese, and eggs are exported to England and large numbers of cattle. There are fisheries all round the coast, chiefly in the west, and much of the fish caught is not landed in Ireland but taken straight to England.

There is scarcely any coal in Ireland, and, therefore, there are very few large manufacturing towns. Ireland is, however, famous for its "cottage manufactures." The women work in their cottages, especially in the north of Ireland, and knit and spin the wool from their husbands' flocks of sheep. They make lace, which is famous everywhere. They also make shirts and finish off shirts, made by machinery, for dealers in the market-towns.

FIG. 66.—LAKES OF KILLARNEY.

Ulster, in the north of Ireland, however, has a great manufacturing centre in Belfast, where the descendants of immigrants from England and Scotland live. They are a different race from the native Irish. Ulster is the richest, most


IRELAND
Chief Towns
English Miles
0 5 10 20 30 40 50
10°
8°
6°
55°
53°
ATLANTIC OCEAN
IRISH SEA
Giants Causeway
Portrush
Londonderry
L. Neagh
Belfast
Donegal Bay
L. Erne
ULSTER
Sligo
CENTRAL PLAIN
CONNAUGHT
L Ree
Dublin
Kingstown
Galway
R. Shannon
Galway Bay
LEINSTER
L. Derg
R Barrow
R. Slaney
Limerick
MUNSTER
R. Suir
Wexford Harbour
Wexford
Waterford
R Blackwater
Dingle Bay
Lakes of Killarney
Cork
Youghal
Queenstown
Kenmare Bay
Bantry Bay
Longitude West 8° of Greenwich

populous, and the best cultivated part of Ireland. Linen goods are made in the factories of Belfast from flax grown in the country around.

The lake district of **Killarney** in the south-west of the island is the most beautiful part of Ireland. The lakes are studded with little islands well wooded, and all around there are green hills.

The south of Ireland has a very mild climate and very rich pasture land. All the seaports on the coast export live stock, meat, and dairy produce, *i.e.* butter and cheese. Wheat and barley are cultivated in the basins of the rivers that flow into Wexford and Waterford harbours—the Suir, the Barrow, and the Slaney.

The **Shannon** is the chief river of Ireland and the longest in the British Isles. It flows slowly along the great central plain and passes through several long lakes in its course, the chief of which are Lough Ree and Lough Derg. In Ireland lakes are called *loughs*, and in Scotland they are called *lochs*. The Shannon is a beautiful stream of water. It has an estuary 70 miles long, at the head of which stands Limerick, the largest town in the south-west.

The bays in the south-west of Ireland—Dingle Bay, Kenmare Bay, and Bantry Bay—are what are known as "*Rias.*" Rias were at one time river valleys, made by rivers which flowed into them. But the land sank and the sea rushed up the valleys. They are sometimes called "drowned valleys" for this reason. On the other hand, the openings of the land on the south coast are fiords like those in Norway. The ending *ford* in the names Waterford and Wexford does not refer to the ford where a river is crossed, but is another form of *fiord.* A fiord is often narrow at the entrance and opens out into the land and is often deeper there than at the entrance. A ria is wide at the entrance and gets shallower and narrower as it runs up into the land, this being the slope down which the river ran. Both rias and fiords are drowned valleys.

CHIEF TOWNS IN IRELAND.

(The population in thousands is given by the figures in brackets.)

Dublin (399), on Dublin Bay, at the mouth of the River Liffey, is the political capital of Ireland and the largest town after Belfast. It has beautiful streets, one of which is shown in the picture in Fig. 67. It is very well placed for trade. It is in the middle of a wide gap of 60 miles in the eastern mountains, so that there is an easy route into the heart of the central plain. Railways run in all directions from Dublin, north, south, and west. Dublin Bay is a beautiful harbour at the narrowest part of the Irish Sea; the distance from Dublin to Holyhead on the coast of Anglesea in Wales being only 60 miles. The Viceroy of Ireland lives in Dublin, where all the Government buildings are. There are two great colleges. Trinity College is the older and more famous; the other belongs to the National University lately founded. There are several great industries in Dublin, the chief being the brewing of beer and the making of whisky. The country around is a famous grazing ground for cattle, of which large numbers are exported to England. In Ireland time is everywhere taken from Dublin Observatory. It is about a quarter of an hour behind Greenwich time.

Belfast (393), in the province of Ulster, is the largest town in Ireland and may be called the commercial capital, as Glasgow is the commercial capital of Scotland. It is well placed for trade both with England and Scotland, being on the bay called Belfast Lough. It is at the mouth of a little river, and the valley of this river opens up an easy route inland. Belfast has large manufactures, the chief industries being ship-building, the making and bleaching of linen goods, and the making of ropes and mineral waters. There are also large tobacco factories. In the linen industry, home-grown flax is used, as well as flax imported from Russia. Irish linen is famous for its softness and whiteness. There is scarcely any coal in Ireland, so coal and iron are imported for the factories and ship-building yards in Belfast from the opposite coast of Scotland. A good deal of whisky is distilled.

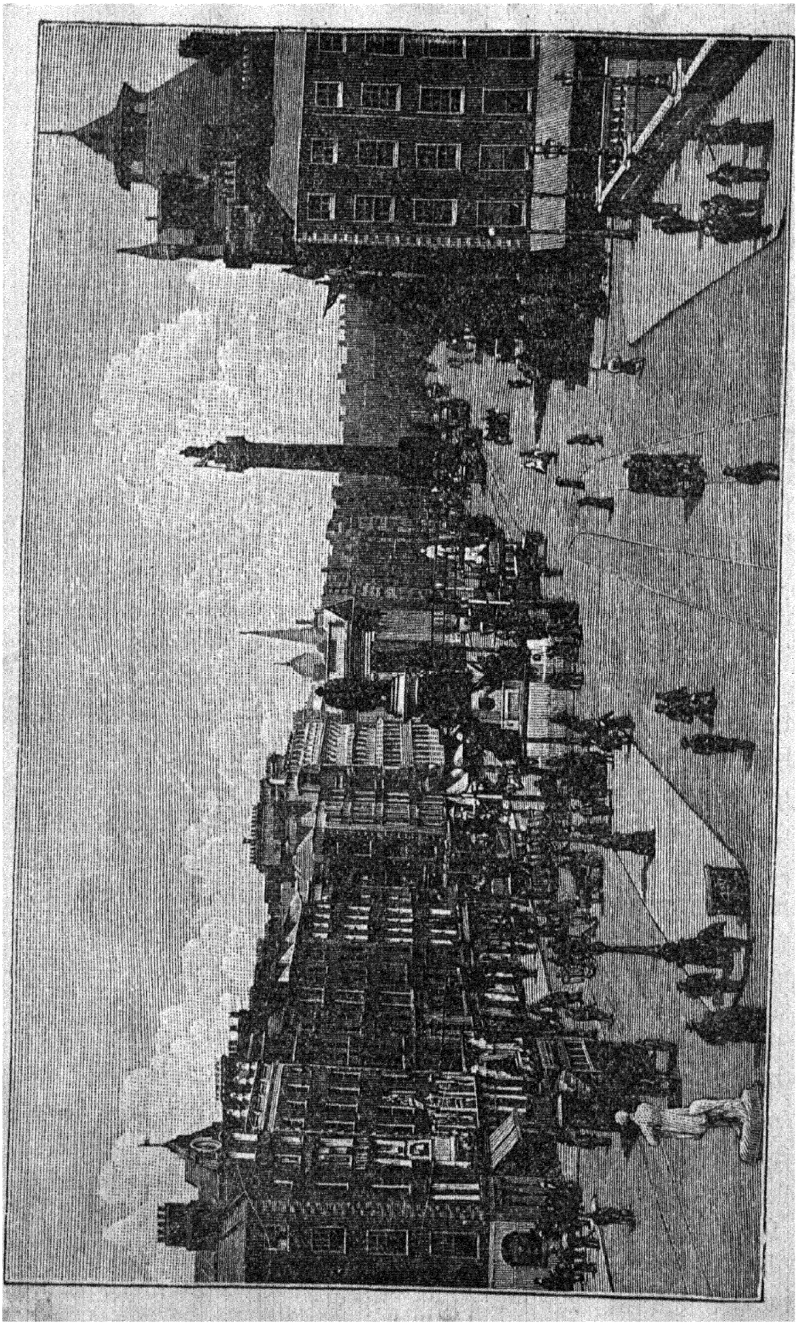


FIG 67 —SACKVILLE STREET, DUBLIN.

Londonderry (41), or Derry, is on the River Foyle, near the head of Lough Foyle. It is the fourth largest town in Ireland. The chief industry is the making of linen goods. Whisky is distilled, and there are salmon fisheries.

Sligo (11), on Sligo Bay, is the chief fishing port of the north-west of Ireland.

Wexford (12), at the mouth of the Slaney, and **Waterford** (28), at the mouth of the Suir, are seaport towns on the south coast. They have good harbours, with rivers flowing into them. In the valleys of these rivers wheat and barley are largely grown. They are so fertile that the district is known as the Golden Vale. From these two towns the same things are exported as from Cork, viz. cattle, butter, eggs, and bacon.

Limerick (39), at the mouth of the Shannon, the great river of Ireland, is the only town of any size in western Ireland. It is the chief market-town of the west. To it the farmers bring for sale their cattle and crops. In the town there are flour-mills, and the largest bacon-curing factories in Ireland. Hides are made into leather.

Cork (77), at the mouth of the River Lee, is the third largest town in Ireland, and may be called the capital of the south. It has a fine harbour which is strongly fortified, and is a naval station and dockyard. Cork exports more butter, eggs, and bacon than any other town in the British Isles.

23. INDIA

NATURAL REGIONS AND PHYSICAL FEATURES.

INDIA forms a great triangle stretching out into the ocean from about the middle of the south coast of Asia. It is divided into two nearly equal parts by the Tropic of Cancer. The northern half is often called **Continental** India, as it is a part of the main continent of Asia with land all round it. It is in the Temperate zone. The southern half is a peninsula which extends for about a thousand miles into the ocean and is therefore called **Peninsu**[illegible]

India. Except on the north, it has sea all round it. It is within the Tropics.

This is **India** proper. The **Indian Empire** is larger, for it includes Burma on the east and British Baluchistan on the north-west. The latter, like Continental India, forms a part of the main continent of Asia. Burma is itself the western part of another peninsula, separated from India by the Bay of Bengal.

The extent of the Indian Empire is about one and three-quarter millions of square miles. This is more than fifteen times the size of the United Kingdom and as large as the whole of Europe without Russia. The population is 319,000,000, which is about one-fifth of the human race.

This great region of the earth is inhabited by many different races and nations, quite as many as there are in Europe. They speak many different languages, and they are divided into many different castes, no one of which may intermarry with any other caste. Their habits, dress, and religions, too, all differ. But they are all under one government and obey the same laws. They, with their fellow-subjects in the United Kingdom, are under the same illustrious emperor. They are tending more and more to look upon themselves as forming one great nation. Although they speak different languages, and each nation naturally loves its own language, yet the educated classes can all speak English, the common language of the British Empire. The educated Sikh, the Pathan, the Bengali, the Mahratta, the Madrassi, the Rajput, and the Burman, all know English and read English books and English newspapers. The Muhammadan and the Hindu, the Brahman, the Kshatriya, and the Sudra all meet in the District Board, the Municipal Council, the Legislative Councils, the Provincial Councils, and the great Council of the Viceroy. They sit, side by side, on numerous committees and boards of banks and companies everywhere in India. They are to be found in all the Government services, and they all help to govern the country and to administer its affairs.

The greatest length of India, from the north of Kashmir to Cape Comorin, is about 2000 miles; and its greatest breadth, from the most easterly point in Burma to the most westerly point in

Baluchistan, is about 2500 miles. The total length of the land frontier is about 6000 miles. The enormous stretch of land within these boundaries extends from the eighth to the thirty-fifth degree of North latitude, that is to say, from the Tropics, the hottest region of the earth, to far within the Temperate zone. It includes ranges of huge mountains, the highest in the world, wide plains, great rivers, lofty plateaus, arid sandy deserts, and fertile river valleys. In a vast tract of land like this, we may expect to find, and we do find, every variety of climate, from the everlasting snows of the Himalayas to the burning deserts of Sind; from the Khasi hills in Assam, with a rainfall of 400 to 500 inches, to the dry plains of the Thar where there is a fall of, perhaps, 2 to 3 inches in the year, and often no rain at all. All the climates of the world are to be found in India. The various factors of climate will decide in what climatic zone any particular country lies, and into what regions it is naturally divided. These will be pointed out in the description of each province and state separately.

But if one were to look down upon the face of the earth from a great height, the surface of India would, as regards its build and natural features, appear to include four great regions, each of which is different in form and shape from the rest. These four regions, excluding Burma and Baluchistan, are:

1. The Himalayas—the region of lofty mountains.
2. The Indus-Ganges valley, the region of great river plains.
3. The Deccan—the region of table-land and hills.
4. The Coast Plains.

THE HIMALAYAN REGION.

The Himalayas include several ranges of lofty mountains, one behind another, with deep valleys between them. They extend for 1500 miles along the whole northern front of India and cover a tract of land from 150 to 200 miles in breadth. This is the Himalayan region. Looked at from the wide plains of Hindustan which lie at their base, the great mountains rise steeply to a height of 20,000 feet, and their snowy summits and peaks are lost in the clouds.

The Himalayan ranges are thus "held," so to speak, "within the arms of two mighty rivers," the Indus on the west and the Brahmaputra on the east. The most westerly peak is the gigantic **Nanga Parbat** which rises to a height of 26,620 feet. It stands in the Punjab Himalaya in the north-west corner of Kashmir, and is covered with eternal snow. **Mt. Everest** or **Gauri Sankar** (29,140), the highest mountain in the world, is in the Nepal Himalaya. **Godwen-Austen** (28,258) is the second highest. It stands about 150 miles to the north-east of Nanga Parbat, on the other side of the Indus, which flows between them. **Nanda-devi** (25,661) is in Kumaon, and is

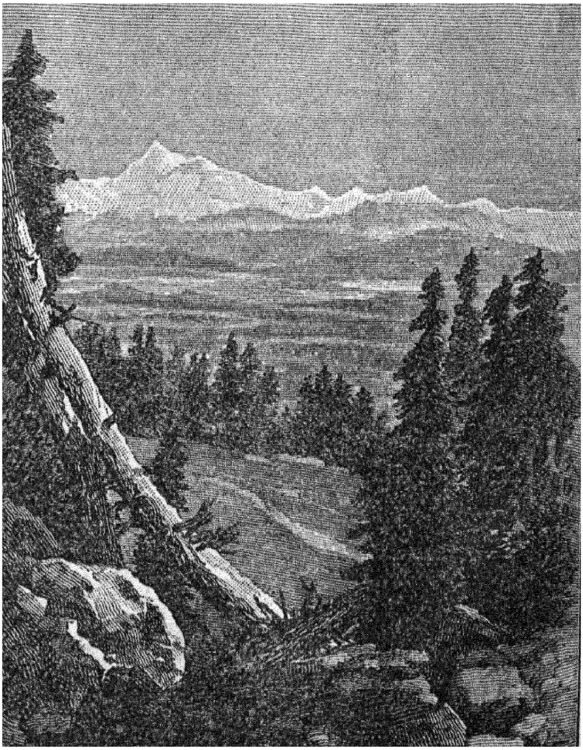


FIG. 68—NANGA PARBAT AS SEEN FROM A DISTANCE OF 80 MILES BY COL. G. STRAHAN, R.E.

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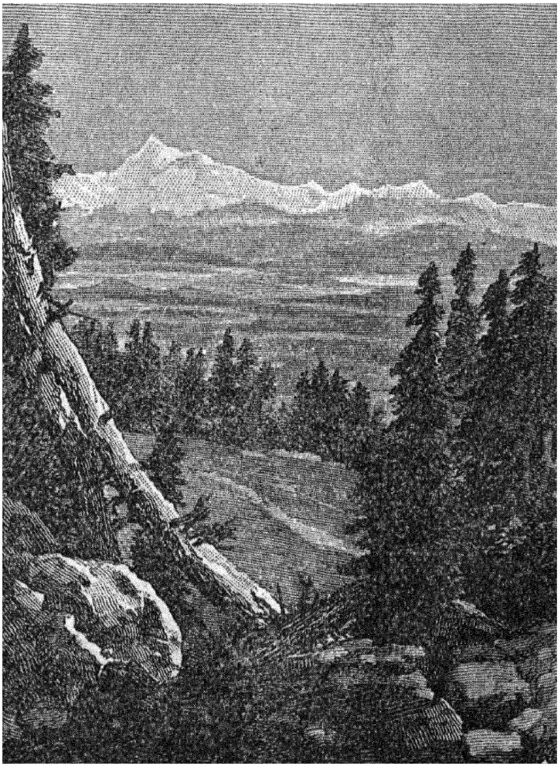


FIG. 68.—NANGA PARBAT AS SEEN FROM A DISTANCE OF 80 MILES BY COL. G. STRAHAN, R.E.

the highest Himalayan peak in British India. **Dhaulagiri** (26,826) is in Nepal. **Kinchinjunga** (28,176), at the eastern end, is also in Nepal, and may be seen from Darjeeling. It is the grandest in appearance in the whole range. There are 114 peaks over 20,000 feet in height in the Himalayas, and of this number, 75 exceed 24,000 feet.

The Himalayan region includes several large Native States, the chief of which are Kashmir, Nepal, Bhutan, and Sikkim. Each of these will be described separately. The perpetual *snow-line*, on the southern side of the great mountain range, varies from 15,000 to 16,000 feet in height, but in winter snow falls much lower, usually at about 5000 feet in the Punjab, and in some places still lower. Numerous *glaciers* run down from the mountains. The point at which a glacier begins to melt is the source of a river. Rivers fed by glaciers go on flowing through the hot season, for the hotter the season gets, the more snow is melted.

The Himalayas are of immense importance to India. They protect the country from invasion from the north. No large army has ever passed or ever can pass through them. They condense the moisture in the clouds driven over them, in the south-west monsoon, into rain which waters all Northern India. The snows on their summits melt on the northern slope, on the Tibetan side, and feed the Indus and Brahmaputra which carry down into India the water they collect in the great northern valley. They also melt on the southern or Indian side and feed numberless streams which flow down into the Ganges and their tributaries. They direct the rainfall of the south-west monsoon into India and prevent it passing over into Tibet and Central Asia. These countries are more or less deserts in consequence of this, while Northern India is a fertile plain. The Himalayas shelter Hindustan from the cold winds that blow down from Central Asia in winter and the burning winds that blow down in summer. Lastly, the very soil, of which the great alluvial plains of Hindustan consist, is Himalayan soil, washed down, age after age, by the great Himalayan rivers. **The Himalayas have made Hindustan, they water Hindustan, they shelter and protect Hindustan.**

THE INDUS-GANGES VALLEY.

This great region of river plains includes all the southern half of continental India. It lies between the Himalayas on the north and the Vindhya mountains and uplands of Chota Nagpur on the south. It extends from the Arabian sea on the west to the Bay of Bengal on the east, a distance of about 1900 miles. It is made up of the silt or alluvium brought down by its rivers, chiefly from the Himalayas in the north, but also from the Vindhyas in the south.

The area of this vast plain is about 300,000 square miles. It includes the basins of the Indus and the Ganges, with the exception of their upper courses, which lie in the Himalayas. The watershed between the two basins is a ridge running north-east from the Aravalli hills to Delhi. The coloured physical Map of India shows the gradual rise of the watershed from 600 feet to 1000 and then to 1500 feet between the two basins. The distance from the ridge near Delhi, to the mouth of the Indus westward is 850 miles, and to the mouth of the Ganges eastward it is 1050 miles. In the plains, the rivers flow gently along, dropping silt as they flow. The rainfall is heaviest in the east, and there the land is most fertile and the population is densest. Westwards the rainfall gradually decreases, till in the far west, south of the Punjab, scarcely any rain falls, and except where there is irrigation by canals, the land is little better than a desert. The soil even there, however, is alluvium. All that it wants is water. The Indo-Gangetic plain is, for its size, the most populous part of India. It is covered with villages, and contains, as well, many large towns and cities, the most ancient and the most famous in India. It includes the provinces of the Punjab, Delhi, the United Provinces of Agra and Oudh, Bihar and Bengal. The eastward extension of the plain is the valley of the Brahmaputra, which is the province of Assam. Each of these provinces will be described separately.

THE DECCAN OR THE REGION OF TABLE-LAND.

From the river-plains on the north and from the coast-plains on the east and west of Peninsular India, there rises a great three-sided plateau, called the Deccan. It begins at the Vindhya mountains where it is about a thousand miles wide. This is the base of the triangle, which gets narrower and narrower southwards till it ends in the Nilgiri Hills about 800 miles to the south. The Western Ghats are the western side and the Eastern Ghats are the eastern side of this triangle. The Western Ghats, however, are much higher than the Eastern, so that the surface of the Deccan slopes from west to east, and nearly all the rivers flow eastward through gaps in the Eastern Ghats down to the coastal plain and so into the Bay of Bengal. The Western Ghats get the full benefit of the south-west monsoon, but they prevent it from reaching the lower level of the plateau to the east of them, lying to leeward. The countries situated here have a climate of extremes and are subject to famine.

The provinces and states of the Deccan table-land are the Central Provinces and Berar, a part of the Presidencies of Bombay and Madras, and the States of Hyderabad and Mysore. Each of these is described separately.

The term Deccan is sometimes applied to the whole of southern India including the coastal plains. The latter, however, are a very different climatic region.

REGION OF COASTAL PLAINS.

The situation of these plains is shown very clearly on Map 6, the coloured physical map of India. All round the coast, from the mouths of the Indus to the mouths of the Ganges, there is a strip of low-lying land, very narrow in some places and widening out in others. This strip is coloured green, showing that it is nowhere over 600 feet above sea-level. In many places it is only just above sea-level.

This coastal plain is the upper ledge of a continental shelf, very much like the shelf on which the British Islands rise, as described on p. 75 in Lesson 18. The light blue colour of the Indian Ocean all round the coast shows the extent of this shelf. The depth of the sea is here nowhere more than 600 feet. The line at the edge is known as the "100 fathom line." The depth of the sea is always reckoned in fathoms, a fathom being 6 feet. Beyond this line, where the water is coloured dark blue, the bed of the ocean drops suddenly to 1000 fathoms and more. From the margin of the seashore the land slopes slowly *downwards* to a depth of 600 feet below the sea on one side, and rises 600 feet *upwards* across the coastal plain on the other, *i.e.* to the end of the green colour on the map.

The width of the continental shelf varies from about 50 miles on the Madras coast to about 300 miles in the Gulf of Cambay. Ceylon is a continental island and was once a part of India. Geologists tell us that the whole land of India once extended far to the west, where the Arabian Sea now rolls. The land sank, and the continental shelf is all that remains of it.

On this shelf the rivers of the Deccan drop the silt they bring down from the mountains, and have been doing this for ages. Opposite the mouths of the great rivers, particularly on the east coast, the land, it will be seen, bulges out. This bulge has been made by the silt of the river, and is its delta.

The coast plain, particularly the deltas of the rivers, being formed out of rich alluvial soil, is very fertile. The countries on these plains have a maritime climate, and are as a rule densely populated. The temperature varies with the latitude and the prevailing winds. The countries situated in the coastal plains will be described separately.

The countries included in the western coastal plain are, Cutch, Kathiawar, the plain districts of Bombay and Madras on the Konkan and Malabar Coasts, Cochin and Travancore. On the eastern plain they are, Orissa and the eastern coast of Madras, *i.e.* the Northern Circars, the Coromandel Coast and the plains of the Carnatic.

Where the Eastern Ghats unite with the Western Ghats in the Nilgiri Hills, the Deccan proper ends. To the south of these hills, the Western Ghats run down for about 300 miles to Cape Comorin, and between them and the Bay of Bengal there is no plateau but a wide plain, the plain of the Carnatic, which slopes down from the Ghats to the sea.

In these plains, watered by the Kaveri, the Vaigay, and other smaller rivers, there is a populous country with very ancient towns, the seats of the old Dravidian kingdoms, the Pandya and the Chola. There are numerous Hindu temples. One of the finest of these temples is in the district of Madura. It is, however, not on the mainland, but on the island of Pāmban in the straits between India and Ceylon. On this island there stands one of the most sacred shrines in India. It is the great temple of **Rameswaram**, said to have been founded by Rama himself as a thank-offering for his victory over Ravana. The gopuram or tower is 100 feet high, the corridors are 4000 feet in length. On the mainland there is an ancient mandapam or inn for pilgrims, shown in the picture.

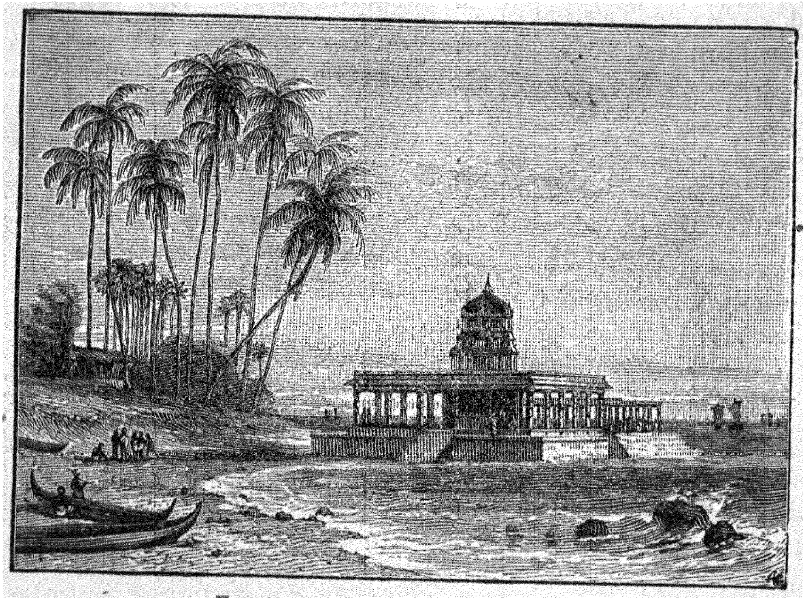


FIG. 69.—MANDAPAM AT RAMASWARAM.

24. INDIA (*continued*).

MOUNTAINS.

THE **Himalayas** have been already described. They are true folded mountains and were upheaved from the bottom of the ocean which once flowed over the surface of the earth north of the peninsula of the Deccan. They are formed of sedimentary and metamorphic rocks.

The **Sufed Koh, Suleiman** and **Kirthar Mountains** are ranges of mountains which form the north-western boundary of India. They are the edge of the tableland of Iran which includes Afghanistan, Baluchistan and Persia. These three ranges rise from the Indus valley to the west, and are from 50 to 150 miles from this river. They are highest in the north and get lower as they approach the Arabian Sea. The most northerly, the Sufed Koh, is divided by the Kabul River from the Hindu Kush mountains. Its valley forms the **Khaibar** Pass from Afghanistan into the Punjab. The River **Gomal** divides the Sufed Koh from the Suleiman mountains and is the boundary line between Afghanistan and Baluchistan, its valley being a pass into the plains. The loftiest peak in the Suleimans is the **Takht-i-Suleiman** (Throne of Solomon), over 11,000 feet high. There are two other Passes through the Sufed Koh along the valleys of two other rivers—the **Kuram** and the **Tochi**. They lead from Afghanistan into the Punjab. Lastly, there is the **Bolan** Pass, along the valley of the Bolan River which divides the Suleiman from the Kirthar mountains. There is now a railway through it, from Quetta in British Baluchistan to Jacobabad in the Punjab.

The **Siwaliks** are a long range of low hills in northern India, running parallel with the Himalayas at varying distances from them, between the Beas and the Ganges, for about 200 miles. Their greatest height does not exceed 3500 feet, and the range is about 10 miles broad. They are covered with forests, and wild animals abound—elephants, tigers, leopards, bears, hyenas and deer.

The **Vindhya** and **Satpura** mountains, with the **Mahadeo** hills, the **Maikal** hills and the plateau of Chota Nagpur form a belt of highlands which rise from the plains of Northern India and form the northern edge of the Table-land of the Deccan, to which they belong. They run from west to east, a little to the south of the Tropic of Cancer, and are all connected by outlying spurs and ranges. They form the watershed of the centre of India.

The Vindhyas extend for nearly 700 miles along the north of the Narbada River. They are the southern edge of the plateau of Malwa and Bundelkhand, as Map 6 shows. They rise from about 1500 to 2000 feet. At their eastern end, the Vindhyas sink into the **Kaimur** hills in Bihar. At Amarkantak, the source of the Narbada, the Vindhyas unite with the Satpuras. The **Satpuras** extend from the coastal plain on the Gulf of Cambay for about 600 miles eastward. They divide the valley of the Narbada from that of the Tapti, and end at Amarkantak, from which point the **Maikal** hills run on for 100 miles farther. Among the Satpuras are several small plateaus which rise above them. One of these is Pachmarhi (3530 feet), the hill station of the Central Provinces. Another is **Chikalda** (3664 feet) the hill station of Birar. **Dhup-garh** (the fort of the Sun) (4454 feet) is the highest peak. The **Aravallis** in Rajputana run north-eastward on the northern plains dividing Eastern from Western Rajputana. Their average height is 2000 feet, but **Mont Abu** at the southern end rises to a height of 5650 feet, being the highest point between the Himalayas and the Nilgiris. They divide the basin of the Indus from that of the Ganges and are the most ancient hills in India.

The **Western Ghats**, a range of mountains about 1000 miles in length, are the western edge of the table-land of the Deccan. The Sanskrit name for them is **Sahyadri**, but this term is now applied only to the northern part. They extend from the valley of the Tapti to Cape Comorin. On their eastern side they throw out many spurs or short ranges across the Deccan. The chief of these short ranges are the **Satmalas**, between [illegible] valleys of the Tapti and the Godavari; and the **Mahadeo** hills between the **Bhima** and Kistna. In Bombay Presidency [illegible] stand about a hundred forts on these Ghats, famous [illegible] Ma[illegible] history, *e.g.* **Raigarh** and **Partabgarh.** The highest peak in this part is **Kalsubai** (5427 feet). On a spur stands the hill station of **Mahabaleshwar.** On leaving Bombay, the Ghats bound the Mysore state on the west, where the highest peak is **Kudremukh** (Horse-face) (6215 feet). In the Madras Presidency they are joined by the Eastern Ghats which sweep across the peninsula to meet them. Here they rise into the high plateau of the Nilgiris, on which stand the hill stations of **Ootacamund** (7000 feet) **Coonoor** and **Kotagiri.** The highest peak on the Nilgiris is **Doddabetta** (Big Hill) (8760).

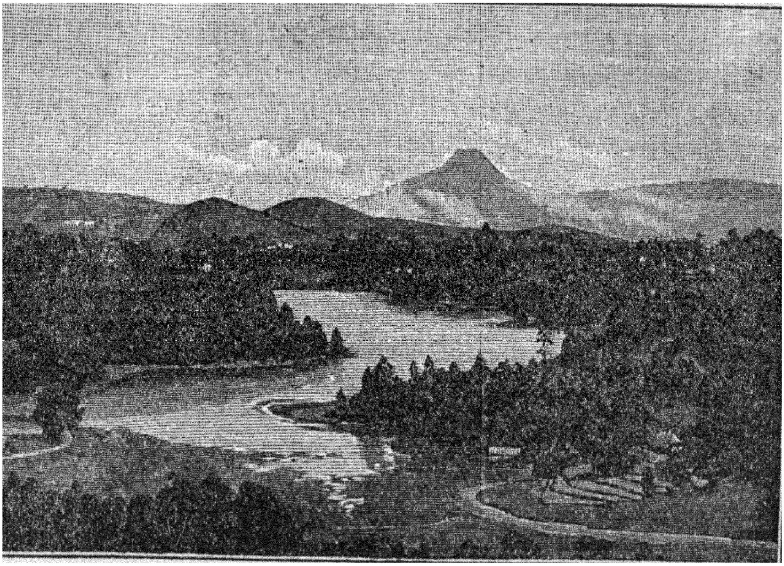


FIG. 70 —KODAIKANAL.

South of the Nilgiris, the Ghats are interrupted by a wide gap, 16 miles across, where they sink to 1000 feet. It is known as the Palghat Gap. The railway runs through it from the eastern to the western coast. South of this they rise to a still greater height and are known as the **Anaimalais** or Elephant hills, and here they throw off long spurs to the east called the **Nelliam-**

nd the **Palni hills.** On the Palnis there is the hill

Kodaikanal.

eautiful hill station stands about 7000 feet above sea-level. It has a perfect climate. The houses are grouped around a wooded lake in a lovely little valley. The temperature is milder but drier and more equable than that of Ootacamund, for the rainfall is lighter, but the grass on the downs is always green. All around there are woods with streams of water winding through them. Near the station is the Observatory, 7700 feet above sea-level. The scenery on the Palni hills around is very fine.

In their southernmost section, the Ghats bound the native states of Travancore and Cochin, and are known as the **Cardamom hills.** The highest peak is **Anaimudi** (8837 feet), the highest point in the whole range. The Western Ghats are covered everywhere with dense forests full of very valuable timber trees—blackwood and teak. In many parts there are tigers, leopards, bears and herds of elephants and bisons.

The **Eastern Ghats** are on the eastern edge of the plateau of the Deccan, but they do not form one long continuous range. They consist of groups of low hills separated by wide gaps, through which the great rivers of the peninsula have forced their way and flow down to the eastern coastal plain and then into the Bay of Bengal. They begin south of the Mahanadi and follow the line of the coast south-westwards. Their average elevation is 2000 feet, but there are a few peaks that rise to nearly 6000 feet. In Ganjam and Vizagapatam they run quite close to the shore, but as they go southward they recede farther inland, leaving a strip of coastal plain from 100 to 150 miles wide. In the north of the Presidency they are called the **Maliahs,** a tract of low hills with a deadly climate. Farther south they are called the **Nallamallais.** South of this they are known as the **Pālkonda.** Where they run westward across the peninsula to join the Western Ghats tney are called the **Biligirirangan** hills.

25. INDIA (*continued*).

Lakes and Rivers.

There are but few lakes in India and they are sma [illegible] them are on uplands and two are lagoons on the [illegible] plain. The **Wular lake** in Kashmir lies at a level of 5180 feet above the sea. It usually covers about 12 square miles, but in time of flood it spreads out to 100 square miles. It is fed by the river Jhelum and several mountain streams. The scenery around is very pretty.

The **Colair** or **Kolar lake**, in the north of the Madras Presidency, lies between the deltas of the Rivers Godavari and Kistna. When full, it is about 100 square miles in area. It is fed by several mountain streams and is being filled up by the silt they pour into it. It is fairly well stocked with fish, and water-fowl abound. In the lake there are many fertile islands with more than two dozen villages.

The **Chilka lake** is a shallow inland gulf or lagoon near Puri in Orissa. A long sandy ridge, in many places not 200 yards wide, separates it from the Bay of Bengal. On two sides there are lofty hills. The lake is about 44 miles long with a mean breadth of 20 miles. The depth is from 3 to 5 feet. It is a fresh-water lake in the monsoons and a salt-water lake in the hot season. Water-fowl are abundant.

The **Sambhar lake**, a famous salt lake in Western Rajputana, is about 50 miles north-east of Ajmer. It lies about 1200 feet above sea-level and covers an area of about 90 square miles. It is fed by rivers which flow over salt soil so that the salt forms a thin white crust on the surface of the lake. Thousands of tons of salt are obtained from this lake every year, worth many lakhs of rupees.

RIVERS OF INDIA.

The chief rivers of India may be divided into three great systems, for there are three great mountain systems, and rivers rise in mountains. These are, firstly, the Himalayan rivers which rise in the Himalayas and their outlying ranges on the north-east and north-west of India; secondly, the rivers of which the sources lie in the Vindhyas and the ranges connected with them; and, thirdly, the rivers of the Western Ghats.

The Himalayan rivers are the largest, for they are fed both by rainfall and by melting snow; and in the second place, two of them—the Indus and Brahmaputra—bring down the rainfall from both slopes of the Himalayas, the northern *and* the southern face. The other two systems—the rivers of the Peninsula—are only fed by rainfall, not by snow, and they drain one face only of the mountains in which they rise.

The three stages of rivers—their upper, middle and lower courses—are described in Lesson 46. These are well marked in the Indian rivers, particularly the Himalayan. They rise at great heights and their upper courses are in the mountains. The sources of most of them are in glaciers from 10,000 to 17,000 feet, and they rush rapidly down to the plains through deep gorges which they have cut for themselves out of the solid rock.

Here their rapid flow enables them to erode the walls of their valleys and widen them considerably. They deepen their beds at the same time and carry down to the plains, rocks, stones, earth, and gravel which they tear down from the sides of the mountains. They flow in the same deep beds for ages and do not change their courses, for they cannot. If they come to a depression or hollow in their flow, they fill it, enlarge it, and form a lake or a wide valley. The Vale of Kashmir was formed in this way by the Jhelum. The Lake in Naini Tal in the United Provinces was made in the same way.

The Ganges flows for 1557 miles through the plains of Hindustan into the Bay of Bengal. All the rain that falls over an area of 400,000 square miles (called its catchment area) finds its way into the Ganges except what sinks into the soil.

It rises in a glacier, consisting of a bed of solid frozen snow, 300 feet thick, called Gao-mukh (Cow-face), at the height of 13,000 feet. This spot is known as Gangotri. It is in the little native state of Tehri-Garhwal, in the United Provinces. It is here called the *Bhagirathi*. Behind it rise the four great snowy peaks of Kedarnath as shown in the picture. The stream is joined at Devaprayag behind the hills of Mussooree by the *Alaknanda* which also rises near Kedarnath, and from this point it is called the Ganges or Ganga, "Mother Ganga" as Hindus affectionately term it.

During the first 180 miles of its course down to Hardwar, the Ganges has a fall of 1000 feet. So far it is a mountain torrent. The next 1000 miles may be considered its middle course down to Rajmahal in Bengal. It is now 400 miles from the sea and has become a broad and mighty river with a vast volume of water. When the river is in flood, about two million cubic feet of water pass along at this point every second of time. Below this, the river may be regarded as being in its lower course. It has a vast delta, 200 miles broad, on the sea-face of Bengal.

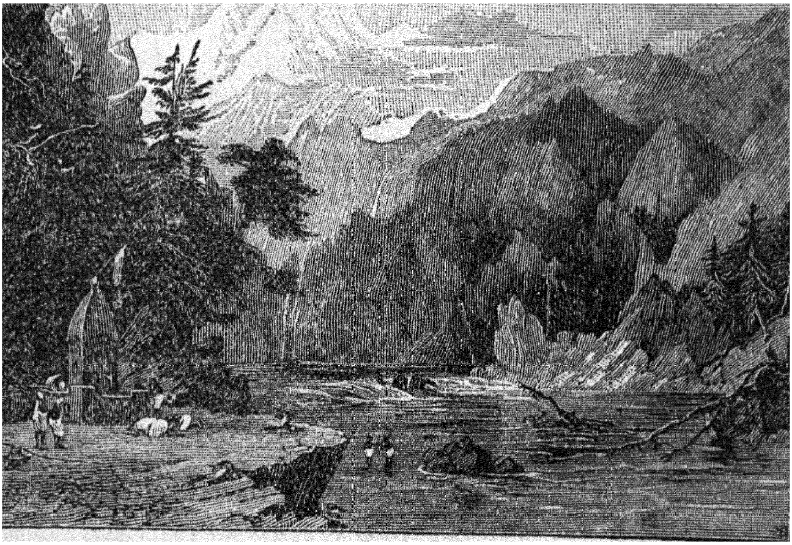


FIG. 71.—GANGOTRI, SOURCE OF THE GANGES.

The Ganges is navigable as soon as it reaches the plains, 200 miles from its source. Numerous canals distribute its water all over the United Provinces. The banks of the Ganges are holy ground to the Hindu. Steps called *ghats* are built down the banks to the water's edge in many places for the convenience of bathers. One of these bathing-ghats near Calcutta is shown in the picture.

The chief mouth of the Ganges in the delta, which begins at about 300 miles from the sea, is the Hugli, or Hoogly, which is the most westerly, and the most important for navigation. The most easterly mouth is the Meghna where the Brahmaputra joins the main channel of the Ganges called the Padma. The Meghna is here about 20 miles wide and 30 feet deep. The volume of water it pours down is enormous. Between the Meghna and the Hugli lies the delta of the Ganges.

The chief tributaries of the Ganges on its left bank are the Gumti, the Gogra (also called the Karnali), the Rapti, the Gandak, the Baghmati, and the Kusi. On the right bank the chief tributaries are the Jumna with its tributary the Chambal, and the Son.

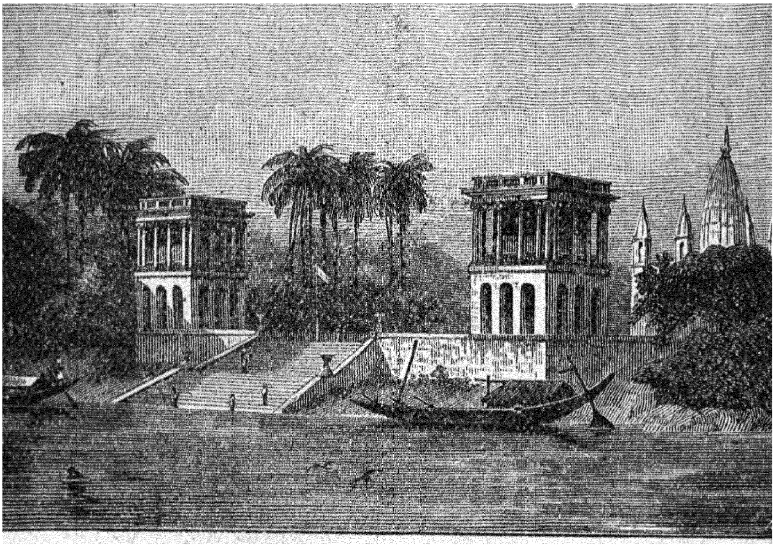


FIG. 72.—BATHING GHAT ON THE GANGES.

The *Jumna* is in itself a mighty river, with a length of 860 miles before it joins the Ganges at Allahabad or Prayag. Its source is a glacier in the state of Tehri-Garhwal near the great snowy peak Bandarpunch. It pierces the Siwaliks 90 miles from its source and then emerges into the plains. Here its middle course begins. It first flows southwards as a large river, and here gives off the Eastern and Western

Jumna Canals. For some distance it forms the boundary between the Punjab and the United Provinces. Above Muttra it turns eastward and flows through the United Provinces into the Ganges. Its chief tributaries on the right bank are the Chambal and the Betwa, which drain the plateau of Malwa and the Aravalli hills. It is crossed by several great railway bridges, that at Allahabad being 3200 feet long. The chief towns on the banks of the Jumna are Delhi, Muttra, Agra and Allahabad.

The Indus rises in Tibet and flows through Kashmir, the North-West Frontier Province, the Punjab and Sind, and falls into the Arabian Sea after a course of 1800 miles. Its source is at a height of 16,000 feet, close to the great Kailas mountain, near Lake Mānasarowar. For the first 160 miles it is known as the Singh-ka-bāb. It first flows in a north-westerly direction along the great northern valley of Tibet. Then, rounding the lofty Himalayan mountain Nanga Parbat, it flows south-westwards to the ocean. Its course for the first 800 miles is in the Himalayas, and for the last 1000 miles along the plains, the Indus valley. It enters the Punjab at Attock, 1100 miles from its source, and up to that point it has fallen 16,000 feet, *i.e.* 15 feet

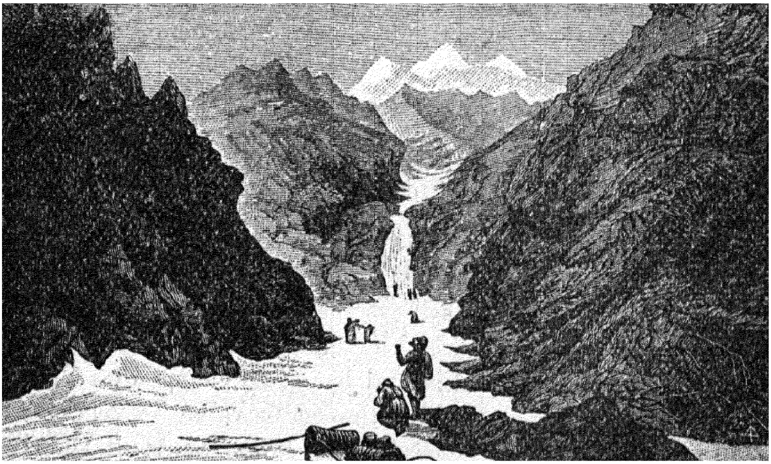


FIG 73 —JUMNOTRI, SOURCE OF THE JUMNA

a mile. It cuts its way through narrow gorges and deep ravines; in one place it flows through a gorge whose sides are precipices 14,000 feet high. It has made, through the Himalayas, the deepest river valley anywhere known.

The Indus has many tributaries. On the left bank there are the five rivers of the Punjab—the Jhelum, the Chenab, the Ravi, the Beas and the Sutlej. On the right bank there are the Kabul River, the Shyok, and many smaller streams that flow down from the Sufed Koh and the Suleiman Mountains, *e.g.* the Kuram, the Gomal, the Tochi, the Bolan and many more. The five rivers of the Punjab unite to form one river, called the Panjnud, which joins the main river—the Indus—near Mithankot, 490 miles from its mouth.

At Attock it is joined by the Kabul River which brings down the waters of Afghanistan. Attock is the first important point on the Indus in British territory, for from this point, 860 miles from the source, the Indus is navigable for the rest of its course of 940 miles to the sea. It is here crossed by a railway bridge on the line from Lahore to Peshawar. The bed of the river at Attock is 2000 feet above the sea-level.

The Indus has a delta which extends along the coast for 125 miles. It has many mouths and has often changed its channel in the Delta. The rainfall in the Indus valley is very small, being not more than 10 inches. The lower course of the river is through a desert. But much of this desert has been irrigated by canals, and changed into fertile land, growing abundant crops of grain. About 6000 square miles of land have been irrigated from the Indus.

The **Brahmaputra**, the third great Himalayan river, rises near Lake Manasarowar in Tibet, at an elevation of 16,000 feet. It first flows eastward for about 850 miles under the Tibetan name Tsan-po, along the high northern valley in Tibet. Then turning round the eastern end of the Himalayas, it sweeps southwards into Assam. This southern sweep of about 150 miles is known as the **Dihang**. It then flows westward, under its Indian name of Brahmaputra, for 450 miles through Assam, draining the Assam Himalayas on the north and the Assam Hills on the south.

When it gets past the Assam Hills, it turns southwards and flows for 150 miles in that direction under the name of the Jamuna, till it joins the Ganges, there called the Padma, at Goalundo. The united rivers, called the Meghna, flow into the Bay of Bengal.

The Brahmaputra has no tributaries as large as the great rivers that flow into the Indus and Ganges, such as the Sutlej and Jumna. Its chief tributaries on the right bank are the Subansiri, the Manas, and the Tista. On the left bank the tributaries are the Dihing, the Dhansiri, and the Kalang.

Assam proper, north of the Assam Hills, is a large alluvial valley formed by the silt deposited by the Brahmaputra, which is navigable up to Dibrugarh, about 800 miles from the sea. The chief towns on its banks are Sadiya, Dibrugarh, Gauhati, and Goalpara.

The **Narbada** rises in the plateau of Amarkantak at the north-east end of the Satpuras, and flows westward into the Gulf of Cambay after a course of 800 miles. It is the great river of the Central Provinces. Near Jubbulpore it flows through a gorge named the Marble Rocks, where it is only 20 yards wide. Its middle course is through the narrow but fertile valley known as the Narbada Valley, which it has covered with alluvial soil. The last 170 miles is through the Bombay Presidency. It forms an estuary 17 miles wide south of Broach city. This river is considered to be the boundary between the Deccan and Hindustan.

The **Tapti** rises in the Satpuras and flows westward through the Central Provinces, along the base of the Satpuras, into the Gulf of Cambay, near Surat. It flows at first, for about 150 miles, through a rocky valley; its lower course is over a fertile alluvial plain which it has made out of silt from the hills. It is only navigable for 20 miles from the sea. It is crossed at Bhusaval by the Great Indian Peninsular Railway and at Surat by the Bombay-Baroda line.

The **Mahanadi** rises in the Maikal Hills and flows eastward for 550 miles into the Bay of Bengal near Cuttack. About half of its course is through the Central Provinces and half through Orissa. Its water is widely distributed over the land by the Orissa Canals. The chief towns upon it are Sambalpur, Cuttack, and Puri.

The Godavari rises in the Western Ghats near **Nasik** in Bombay, about 50 miles from the Arabian Sea. It flows for 900 miles across the Deccan, through Bombay and Hyderabad. Then, bursting through a deep gorge in the Eastern Ghats, it flows across the coastal plain of the Madras Presidency. It has a wide delta watered by canals from the river. The tributaries of the Godavari are—on the right bank, the Manjira; on the left, the Purna, the Indravati, and the Pränhita, which is itself fed by the Painganga the Wainganga, and the Wardha. The Godavari is the great river of Hyderabad. At Rajahmandry, near its mouth, there is a fine railway bridge 1¾ miles long. Over it the line from Madras to Calcutta passes. The head of the delta is at Dowlaishwaram, 40 miles from the sea. Here a great masonry dam or anicut has been built across the river to hold up water for the canals, 2600 miles in length, which water the land around.

The **Kistna** (Krishna) rises near Mahabaleshwar, about 40 miles from the Indian Ocean, and flows eastwards for 800 miles, across the Southern Deccan into the Bay of Bengal. For the first 300 miles its upper course is through the Bombay Presidency; the middle course is, for 400 miles, through Hyderabad state, and its lower course of 200 miles through Madras. The tributaries on its left bank are the Bhima and the Musi, and on the right bank, the Tungabhadra, which is formed by the Tunga and Bhadra. At **Bezwada**, near the head of its delta, about 45 miles from the sea, the river runs through a gap 1300 yards wide, in a low range of hills, and here an anicut has been built across it. From the water thus held up, about 2000 miles of canals have been made which water over 1000 square miles of land. In the picture there is the still water of the river on the left, on the right there is the rush of the foaming stream over the slope of the anicut.

The **Kaveri** (Cauvery) rises on the Brahmagiri mountain in Coorg and flows for 475 miles in a south-easterly direction across Coorg, Mysore and the Madras Carnatic Plain, into the Bay of Bengal. In Mysore, 12 anicuts have been built across the river, from which about 1000 miles of canals irrigate the country. In this state the river forms two famous islands—Seringapatam, on which stood the strong fort of Hyder Ali and Tipu Sultan; and Siva-samudram, where the river forms the beautiful Cauvery Falls, falling over rocks to a depth of 320 feet. Here a dam has been built and electricity generated which transmits power for working the Kolar gold mines, 92 miles distant, and for lighting Bangalore, 59 miles away. Below Trichinopoly, the Kaveri forms two channels, the northern being called the Coleroon. From them, canals water over a million acres. Tanjore, in the Kaveri delta, is the garden of southern India.

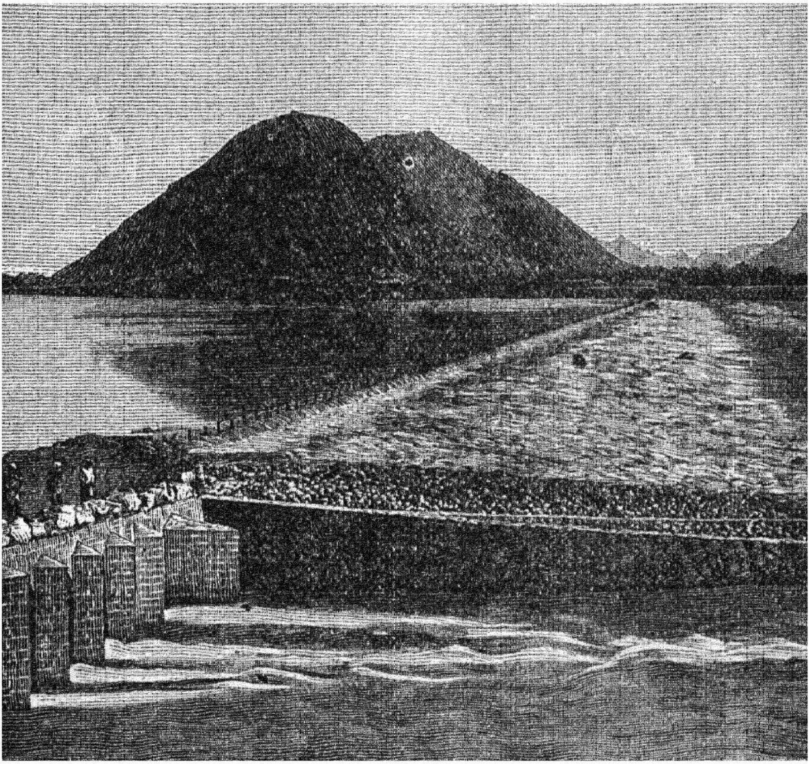


FIG. 74 —BEZWADA ANICUT OVER THE KISTNA.

26. INDIA (*continued*).

CLIMATE, RAINFALL AND TEMPERATURE, MONSOONS.

THE great climatic regions into which India is naturally divided have been described already in Lesson 23. The build of the land is so different in different parts; its mountains, table-lands, and plains extend through so many degrees of latitude, some of them being in the Tropics and others in the Temperate zone; the sea is so distant from some of the countries in India and so near to others that there cannot but be many varieties of climate.

Temperature.—In Northern or Continental India there are great extremes of temperature, the thermometer rising in some places to 120° in the hot season and sinking below freezing-point in the cold season: The range of temperature, even in 24 hours, is also very great. In Southern or Peninsular India there are fewer extremes, and the daily range is less. There is no real cold season except on the hills; the coolest time in the plains being in the rains. This cool season is considered a very warm season by natives of the British Isles.

Isotherms.—In Lesson 51 isotherms are described, and it is shown how they indicate temperature, and how temperature changes with the seasons. Map 7 of Seasonal Temperature in India shows these changes very clearly, both by isotherms and different tints of colour.

There are four maps—for November, February, May, and August. High temperature, *i.e. heat*, is shown in *red.* There are three tints of red, showing temperatures of 80°, 90°, 95°, and upwards. Low temperature, *i.e. coolness*, is shown in *green* and yellow. There are five tints of green and yellow, showing temperature below 60°, 65°, 70°, 75°, and 80°. The darker the red, the higher the temperature; the darker the green, the lower the temperature shown.

It is very clear from these maps that it is much cooler in November than in May. In the *November* map there is no red (except for a very small tract in Travancore). In this month the temperature is nowhere above 75° (except in the little tract noted). The map is all yellow or green, and the tints show that it grows colder and colder as one goes northwards. In *February* the map is still all yellow or green except that the space coloured red in Travancore has increased in size, while there is a large tract of red in the Deccan around Bellary—the plateau of poor rainfall under the lee of the Western Ghats—where the temperature rises to 80°. *May* is the hottest month in the year. The map is now nearly all red. The hottest part of India is in the centre, in the Central Provinces and Central India, far away from the sea. Here the thermometer stands at 95° and upwards. In *August* the south-west monsoon is blowing and the west coast is now coloured yellow. The hottest part of India, coloured dark red, is now the Punjab.

Rainfall, the Monsoons.—As nine-tenths of the people of India depend upon agriculture for their livelihood, the rainfall is to them very important indeed. There are two rainy seasons in India—the summer rains called the south-west monsoon, and the winter rains known as the north-east monsoon.

How the monsoons are caused is shown in Lesson 54. The trade-winds blowing from the north and south towards the equator are changed into north-easterly winds and south-easterly winds by the velocity of the earth's surface at the equator, spinning from west to east.

If there were sea, and only sea, between the Tropics, the winds would go on blowing in these directions. But in the eastern hemisphere there is the enormous land-mass of Asia, and from it the great peninsula of India stretches far into the Indian Ocean. There is an upward movement of heated air, in the hot season, from the great mass of land, leaving a vacuum or half-empty space over the land. This changes the direction of the south-easterly trade-winds. They blow towards the land to fill the vacuum and become south-westerly winds. They are laden with moisture, coming, as they do, from the sea. These moist south-westerly winds are the south-west monsoon. When they meet with high hills or mountains they blow up their sides into the cooler space above them, and the water-vapour in the clouds is there condensed into rain and falls in showers of rain. Where there are no mountains, the winds blow straight on, dropping no rain.

The average rainfall for the whole of India, taken from the returns from 2000 stations, is 45 inches, and nine-tenths of this rain fall in the south-west monsoon. From June to September, these moisture-laden winds blow over a great part of the country, and the crops of at least five-sixths of the Indian empire depend upon the rain they drop. The south-west monsoon blows up from the ocean in two great currents, one up the Arabian Sea and the other up the Bay of Bengal. Part of the Bay current turns eastward to Burma, to fill the vacuum over the land there. But most of it blows up the Bay and gives rain to Assam, Bengal, Orissa, and most of the Ganges valley. Though this current is not so large as the other, from the Arabian Sea, it drops more rain over a wider extent of country. There is first a very heavy fall of rain on the Khasi Hills, which rise up steeply from the plains right in the path of the monsoon. Then the winds are turned westward by the Himalayas and blow up the Ganges valley, dropping rain as they go.

The Arabian Sea current, on reaching India, meets with the Western Ghats, a continuous range of mountains extending for 1000 miles from Cape Comorin up to the mouth of the Tapti, and rising into the air, to the height of from 3000 to 6000 feet. The moist winds cool rapidly as they rise up the sides of the Ghats and drop most of their rain. One part of the current blows up the valleys of the Tapti and Narbada, and drops rain on the Satpuras and Vindhyas, and in the Central Provinces. The northern part of the current blows across the sandy plains of western Rajputana, but gives little rain, except in the coast districts, until it reaches the Aravalli Hills. It does not reach Sind, which lies to the west, for it is turned aside by the rotation of the earth. It passes on into eastern Rajputana, where it meets the current coming up from the Bay of Bengal, and combines with it to give rain to the east of the Punjab and Rajputana and the western Himalayas.

This great rush of air northwards follows the sun as it advances northwards to the Tropic of Cancer, heating the land as it goes. The line of greatest heat is under the sun (p. 22). This rush of air is the south-west monsoon, which advances with the sun. It may be called the advancing monsoon. Towards the end of June the sun, having reached its northern limit, *i.e.* the Tropic of Cancer, turns southwards. In September it is over the equator, which is now the line of greatest heat. The winds follow it, and the south-west is now a retreating monsoon. It brings back with it some of the moisture it took northwards. During the latter half of September and the first half of October the south-west monsoon withdraws from northern India, and in November from Peninsular India, giving moderate rain to the Deccan and Madras coast districts.

As the sun reaches its southern limit, the line of greatest heat moves southwards. The sea is now warm and is a region of low pressure. The great continent of Asia has cooled down and is a region of high pressure. The north-easterly trade-winds blow from the land to the sea. This is the north-east monsoon. As it comes from the dry land it is a dry wind, but in passing over the Bay of Bengal it takes up some moisture and drops it in South India, chiefly on the eastern coast, which depends on this monsoon for its rain, as well as on the retreating south-west monsoon.

The south-west monsoon appears to be due to the *lower* current of the air over India, not to the upper currents which pass high over the Himalayas to the heated table-land of Central Asia. India is shut off by great mountain ranges on the north-west, north, and north-east from the rest of Continental Asia, and the lower air currents keep within this enclosed area. The south-west monsoon is due to the peninsula itself, not to Continental Asia.

The intense summer-heat of the plains of Rajputana and the eastern Punjab—the Indian Desert—is therefore of very great benefit to the rest of India, for it gives it the south-west monsoon. If this tract of land were cool—if instead of wide stretches of burning sand there were green fields—there would be no region of low pressure to attract the moisture-laden winds.

27. INDIA (*continued*).

AGRICULTURE, CHIEF CROPS, MINERALS.

INDIA is an agricultural country, a land of farmers. Quite nine-tenths of the population live by agriculture. The Indian ryots are among the most skilful cultivators in the world. Northern India, as a whole, differs very much from Southern India in soil, climate, temperature and rainfall. The crops are therefore different, and the methods of cultivation are different. Indian ryots depend chiefly upon rainfall, and for them, in most parts of India, there are four seasons in the year. There is, firstly, the south-west monsoon from June to October—*the* rainy season—in summer. Secondly, the north-east monsoon in November and December in the autumn. Thirdly, the cold-weather months of January and February. Lastly, the hot-weather, or spring, months from March to May.

In Northern and Central India there are two terms everywhere used by ryots—*Kharīf* and *Rabi*. These are the names of the two main harvests of the year. The *kharīf* harvest is reaped in autumn, the *rabi* in spring. The *kharīf* crops are sown in the beginning of the south-west monsoon, in June and July, and reaped between September and December. They all want warmth and heavy rain. The *rabi* crops need less rain. They are sown in October and November, and ripen in March and April. They do not mind cold.

The countries with heavy rainfall are Bengal, Assam, Burma and the western coast plain. Here there is a rainfall of 70 inches and upwards. The tracts with a very light rainfall of 10 to 12 inches and less are Sind, Rajputana and the plains of the Punjab. The irrigated countries where canals water the fields are the Punjab, the *doāb* between the Jumna and Ganges, and the deltas of the Mahanadi, Godavari, Kistna and Kaveri.

The chief crops may be put into the following classes :—

Cereals.—Rice, wheat, the millets, barley, oats and maize

Pulses.—Gram, beans and peas.

Oil-seeds.—Linseed, gingelly or sesamum, ground nut, castor-oil and mustard.

Garden crops. — Sugar-cane, ginger, turmeric, potatoes, brinjal, chillies, onions, garlic, carrot, radish.

Fibre plants.—Cotton, jute, hemp.

Drugs, Narcotics and Dyes.—Tobacco, poppy, hemp, pepper, betel, nutmeg, cardamom, tea, coffee, cinchona, indigo, cloves and cinnamon.

These are the common English names. The vernacular names differ in different parts of India.

Wet crops are such as need irrigation and *dry* crops depend solely on rain.

Besides these there are *fruits* grown in gardens or orchards.

CEREALS.

All the cereals are merely cultivated grasses which once grew wild. They are found in all countries, but grow best in the countries of which they are natives.

Rice (*Dhān*) has been cultivated in India from the earliest times. It requires heat and moisture, and is therefore grown best in tropical or warm temperate climates. It flourishes in tracts which have a heavy rainfall or are irrigated from canals. About a third of all the rice in India is grown in Bengal. Other important rice-growing countries in order are Burma, Madras, the United Provinces, the Central Provinces, Assam and Bombay.

FIG. 75.—RICE.

There are more than 100 different kinds of rice, of which the grains are fine or coarse, long or round, large or small

The finest rice is scented. *Paddy* is the name given to rice before it is husked. In Madras three crops of rice are sometimes grown in the year in the same fields, watered from canals. In Bengal there are two crops, an *aus*, or early spring (*rabi*) crop, and an *āman*, or autumn (*kharīf*) crop. In other parts of India rice is a *kharīf* crop. The best soil for rice is clay, or clay mixed with sand, *i e.* loam. There is a large export of rice from India and Burma, unless there be a famine anywhere, when the rice is kept in the country. In 1919 the value of the rice exported was 182 millions of rupees.

FIG. 76.—WHEAT.

Wheat (*Gehun*) is a crop of the warmer and drier parts of the Temperate zone. It grows more widely than any other food-grain, for there are many kinds which suit different climates. In India it is always grown in the cold season, chiefly in the north and hardly at all in the south. The most important wheat-growing countries are the Punjab and the United Provinces (where the land is irrigated from canals), the Central Provinces and Bombay. There are many sorts of wheat, hard and soft, white, yellow and red. It is a *rabi* crop. It takes from four to five months to grow, and requires three or four waterings during this period. The Punjab exports large quantities of wheat to England, chiefly from Karachi. Wheat is always eaten in the shape of bread or flat cakes (chu[illegible]is) made from wheat flour.

FIG. 77.
JOWAR OR CHOLUM.

The **Millets** are *small* food-grains such as are ground in *mills*. There are many kinds grown in India, the chief of them being:

The *Great Millet*, Jowār or Cholum; the *Spiked Millet*, Bājra or Cumbu; and the *Small Millets*, Rāgi and others. *Jowār* is the name in Northern India, and Cholum (or Jōla) the South

Indian term. The plant has large leaves and stout stalks, and grows to a height of 6 or 8 feet. There are many different kinds, and the colour may be white, yellow, red, or brown. Jowār is a most important food crop, and is also widely used as a *fodder* crop, *i.e.* as food for cattle. It flourishes best in clay soil, and is most largely grown in the Deccan. It must have good rain of from 30 to 40 inches, for it is a dry crop. It may be a *kharīf* or *rabi* crop according to the climate and rainfall.

Bājra or *Cumbu* is very much like *jowār*, except that the head is a long spike. It has thick leaves, and grows to a height of from 6 to 8 feet. It is grown more largely than *jowār* in the Southern Deccan and in Madras. It is a dry crop, grown for fodder as well as for food.

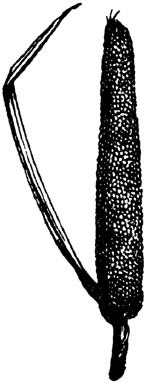


FIG. 78.—BĀJRA OR CUMBU.

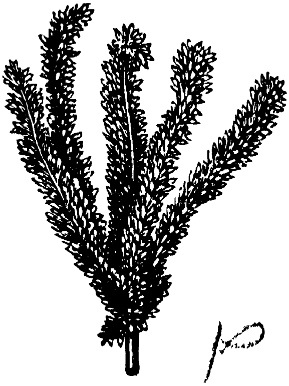


FIG. 79.—RAGI.

Rāgi is one of the small millets. It has a small black grain, which is ground into flour and made into cakes, or a sort of thick gruel or pudding (*kalloo*), and is the chief food of the people of Mysore and parts of Hyderabad and Madras. It is also grown largely in Bihar, and, to a less extent, in the Un[illegible] Provinces, the Punjab, and Bombay. It has small leaves, [illegible] grows to a height of from 2 to 3 feet. It is both a dry crop and a crop irrigated from wells. The grain will keep good for many years, and is often stored in pits against a time of famine. It is not exported.

Maize, or Indian corn (*Bhutta*, *Makkai*, or *Makka Cholum*) is not a native of India, but was probably brought by the Portuguese from America about 300 years ago. It is mostly cultivated in India in gardens and irrigated, but it grows also as a dry crop. The plants grow from 6 to 8 feet high. There are many kinds, both red and yellow. The cobs are boiled or roasted and eaten, and the stalks used as fodder for cattle. The flour (corn-flour) is also made into cakes. It is grown chiefly in Bihar and the United Provinces, but is cultivated all over India, even by hill tribes.

Gram (*Chenna*, *Kadle*), also known as Bengal gram, is cultivated in the United Provinces, in Bihar, and the Punjab, and, to a smaller extent, in the Central Provinces. The seeds are brown and black. They are eaten everywhere except in Madras, and used very widely as food for cattle and horses.

FIG. 80.—MAIZE.

Beans and *Peas* of many different kinds are grown very largely, chiefly in Madras where they take the place of Bengal gram.

Sugar is made chiefly from the sugar-cane; but in Madras, Bengal, and Upper Burma, it is also prepared from the sap of the coco-nut, the Palmyra, and the sago palm, and is known as *jaggery.*

The *Sugar-cane* (*Ukh*, *Karambu*) grows nearly everywhere in the plains, but half the total production in all India is in the United Provinces, where about 1¼ million acres are planted. It is also grown largely in the other provinces. In Northern India the raw sugar is called *gūr*. The plant is always irrigated, except in black cotton soil where it is often grown as a dry crop. There is an export of sugar, but a much larger import. Sugar is second only to cotton in value as an import.

OILSEEDS.

Oilseeds are used in India both for food and sweetmeats and from them are made oils, used for lighting and for anointing the body. They are grown very largely in every part of India both as *rabi* and *kharīf* crops.

Tīl (also called *Sesamum* and *Gingelly*).—There are many kinds, with seeds of all colours. The plant is from 3 to 4 feet high. The fruit is a capsule, which opens when ripe at the top, and is full of seeds. The largest crops are in Bengal, but the plant is grown very largely all over India. It flourishes best on clay, but it will grow in almost any soil. The oil is very largely used in Indian cookery. *Tīl* is the most widely grown and the most valuable of all the oilseeds. Immense quantities are exported, chiefly for soap-making.

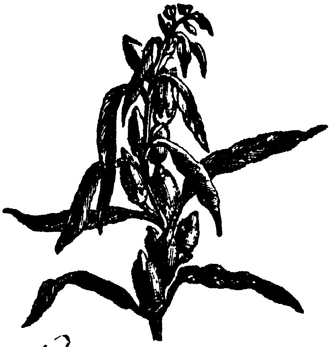


FIG. 81 —TĪL.

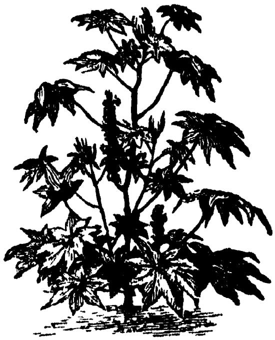


FIG. 82.—CASTOR OIL.

Castor-oil plant (*Eri* or *Arand*) flourishes in a warm temperate climate both in the plains and on hills up to 6000 feet. It is a bush in some places, and in others it grows into a tree from 15 to 30 feet high. It is cultivated all over India, and grows wild in Burma and Assam. A species of silkworm feeds on the leaves. It is used everywhere as a lamp-oil, and exported largely for soap-making. It is a *rabi* crop and will suit any soil. The berries or capsules take nearly a year to ripen. The oil is made by grinding the seeds in mills. The exports are worth over a crore of rupees.

Linseed (*Alsi*) grows about 2 feet high and has a pretty blue flower. In other countries flax is made from the fibre, but in India linseed is cultivated for the oil made from the seeds. The oil is exported and the oil-cake is excellent food for cattle. It grows everywhere in the plains and in the hills up to 6000 feet. The exports are worth over three crores of rupees.

FIG. 83.—LINSEED.

Ground-nuts (*Mung-phali*, *Verukadle*) are also called earth-nuts, pea-nuts, and monkey-nuts. They are grown chiefly in Madras, also in Bombay. They do well both with and without irrigation, and are both *rabi* and *kharīf*. The ground-nut is grown chiefly for export, and used in soap-making and in the manufacture of perfumes in Europe. It is also used for food.

Mustard seed (*Rai*) and *Rape seed* (*Lahi*) yield a bitter oil more used in Indian cookery than any other. They are cultivated chiefly in Bengal and Assam, also in most parts of Northern India. The exports of rape seed are worth 2½ crores and those of mustard about 600,000 rupees. There is also a large export of the oil.

Fibre Plants.

The fibre is used for making ropes, bags, and cloth. There are three great fibre plants—cotton, jute, and hemp.

FIG. 84.—COTTON.

Cotton (*Kapās*) is grown both for use in Indian mills and for export. There are many varieties. Some take eight months to be ready for the harvest and others five months. They are a dry crop and are grown chiefly in the Central Provinces, Berar, the Punjab, Bombay, also in Madras and the United Provinces, but scarcely at all in Bengal, Assam, and other damp hot climates. The best soil is the black clay well known as "black cotton soil," but excellent cotton grows on the alluvial soils in Northern India where the climate is fairly dry and cool. The raw cotton is exported to the value of 41 crores of rupees.

Jute (*Pāt* in Bengali).—This valuable plant grows altogether in Bengal and Assam. It thrives best on clay, in a hot damp climate. It is a *kharīf* crop. The stems of the plants are tied in bundles and put into tanks of water for two or three weeks. The bundles of stems are then beaten and the clean fibre drawn out. The fibre is exported or made up into cloth bags called "gunny" and ropes. There are many jute-mills in Calcutta. In the British Isles the jute is chiefly made up in Dundee. Raw jute to the value of 16 crores, and manufactured jute to the value of 53 crores of rupees are exported.

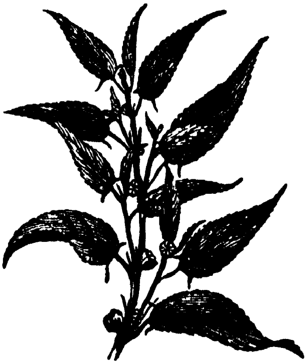


FIG. 85 —JUTE.

Hemp.—This plant yields fibre, seeds, and a drug known as bhang, hashīsh, gānja, and majūn. It is grown all over India, and there are many varieties. Oil is made from the seeds, and used in lamps, and the oil-cake is given to cattle. *Majūn* is a sweetmeat made from the seeds. *Bhang* is an intoxicating drink, but not so deadly as *gānja* which weakens the brain and leads to insanity. About 3000 acres of land are cultivated for hemp.

DRUGS, NARCOTICS, AND DYES.

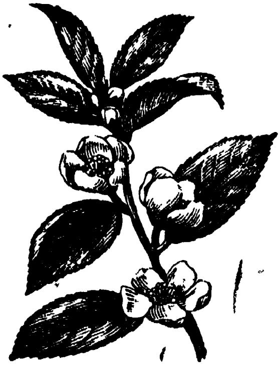


FIG. 86.—TEA.

Tea is found wild in the Nagâ Hills and Manipur. In Assam the cultivation began about the year 1850. Tea gardens are now found in many hill ranges on the slopes of the Himalayas, the Nilgiri Hills, the Palnis and Anaimallais in Southern India. Tea also grows in the plains in Assam, in Cachar and Sylhet. A rainfall of about 100 inches is wanted for tea. It grows best in a moist warm climate. It will not grow in clay, but flourishes in a sandy loam. The trees are cut down into bushes from 4 to 5 feet high, the leaves are picked about twelve times in the year. The young shoots and buds give the best tea, termed Pekoe. The coarser leaves are termed Congou and Souchong. When the leaves are picked, they are withered, rolled, and dried. The export of tea now amounts to 12 crores of rupees.

Coffee was brought to Mysore about two centuries ago, but coffee gardens were not begun till about 1860. The plant is now grown in Mysore, Coorg, Travancore, and on the Nilgiri and Shevaroy hills. The trees are cut down to a low bush from 4 to 5 feet high. They bear white flowers which turn into red berries, each with two seeds. The pulp is rubbed off and the seeds exported. Coffee grows best at an altitude of 2000 to 5000 feet, in a temperate climate, with a rainfall of 70 to 90 inches. The value of the coffee exported is about 1½ crores.

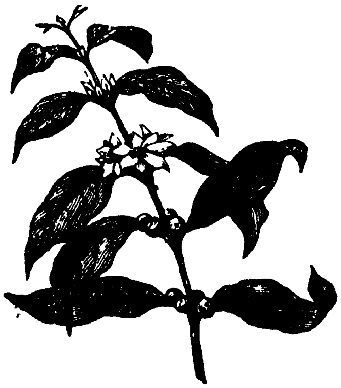


FIG. 87.—COFFEE.

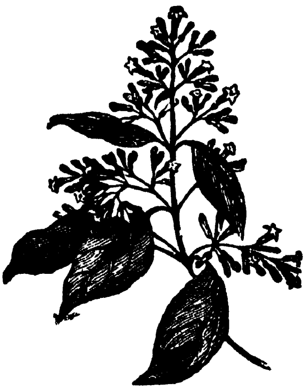


FIG. 88.—CINCHONA.

Cinchona.—From Cinchona quinine is made, which prevents and cures fever. Government plantations were started in India in 1862 with seed from S. America, of which country the plant is a native. The main centres of cultivation are now Darjeeling and the Nilgiri Hills. The plant grows only in the hills. The bark of the trees is cut off, dried, and powdered. Quinine is sold by Government very cheaply all over India.

Indigo (*Nīl*) has been grown in India from very early times. It was one of the first exports of the East India Company from Surat. There are at least forty varieties. It is now cultivated chiefly in Bihar, Madras, and the United Provinces. The blue colour is in the leaves, which are soaked in vats half filled with warm water for about twelve hours. The liquid is drawn off and the indigo settles at the bottom of the vessel. It is then dried and cut into cakes. The dye is used in India and exported as well, the value of the export being about 41 lakhs. An artificial blue dye made in Germany has of late years been much used instead of the natural indigo. It is cheaper, but not so good.

Tobacco (*Tambāku*, *Surti*) is a native of Tropical America and was brought into India by the Portuguese about the year 1600. It is now smoked by all classes in India, except the Sikhs.

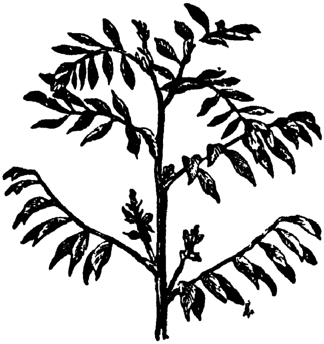


FIG. 89 —INDIGO.

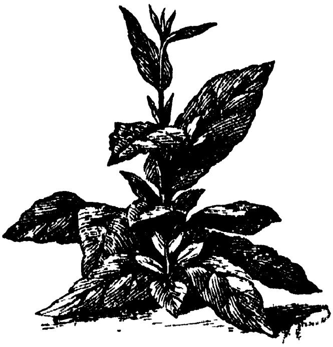


FIG. 90 —TOBACCO.

The leaf is chewed in South India; powdered tobacco or snuff is "snuffed" up the nostrils, and the leaf is smoked in the shape of cigars and cigarettes, or in a pipe or hookah. The plant, which is about 5 feet high, has very large green leaves and a white sweet-smelling flower. It is grown chiefly in Bengal and Assam; also in Madras, Burma, the United Provinces, and the Punjab. It has to be heavily manured and irrigated. The leaves are picked, and dried for about two months. The best cigars in India are made from tobacco gardens in Dindigul in Madras. A great deal of the tobacco grown in India is used in the country. The exports are worth about 74 lakhs of rupees. Both cigars and cigarettes are also imported very largely, to the value of over 295 lakhs.

The Poppy (*Posta*) is a native of the Mediterranean coast

The plant is about 3 feet high, and has pretty white or red flowers The seeds in the capsule are white or brown or black. It is a *rabi* crop. The capsules of the growing plant are lanced or scratched with a knife and a gummy juice comes out. This is opium. The ripe seeds yield oil which is exported. The oil-cake is good cattle food. The Poppy is grown in some Native States, chiefly in Indore, Gwalior, Bhopal, Udaipur, and Rajputana. In British India it is grown in Bihar and the United Provinces; but the ryots who grow it must sell it to Government at a fixed price, and the preparation and sale of the opium is conducted by Government. There were formerly very large sales of opium to China, and a large revenue was raised, but because of the evils of opium eating and smoking, the British Government has cut down the growth of the poppy and the sale of opium very much. In 1920-21 the sales amounted to about 2½ crores of rupees. Ten years ago the amount was over 10 crores.

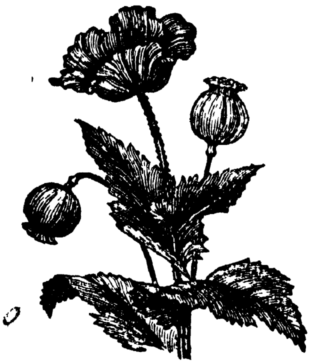


FIG. 91.—THE POPPY.

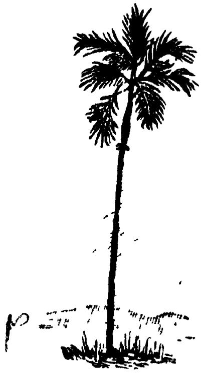


FIG. 92 —ARECA NUT PALM.

Spices.—Betels, cardamoms, pepper, cloves, cinnamon, and nutmeg are all spices. The betel is chewed, the others are eaten with food to give it a flavour. The exports of spices (1921) were valued at 83 lakhs, and the imports at 191 lakhs.

The *Areca nut* (*Supāri*, *Pāku*) palm is a tall and graceful tree which has a life of from 60 to 100 years. The nuts grow in bunches among the leaves. The palm flourishes in the hot, damp coastal plains, but will grow in well-watered gardens, up to an altitude of about 2000 feet, as it does in Mysore. It is largely cultivated on the Malabar coast, Burma, Bengal, and Assam. The nut is known as betel-nut (supāri), and is chewed with betel (pān) leaves, lime, and spices. It has been grown in India from the earliest times. The *betel vine* is planted at the foot of the areca palm and climbs up it.

Pepper (*Kāli mirch*, *Menasu*) grows on vines which are trained to climb up the areca nut tree, as well as the betel vine. It grows to a height of 15 to 20 feet. On the stem of the vine grow long bunches of green berries. They are picked and soaked in water for a week. The pulp decays and is rubbed off the stone or kernel inside the berry. It is then dried in the sun. Both white pepper and black pepper are yielded by two varieties of vine. Pepper grows wild in the forests of Malabar and South Kanara. It was one of the earliest and most important articles of trade between Europe and India in the Middle Ages. It is grown in the same countries with the areca nut, but the best pepper comes from the west coast of India.

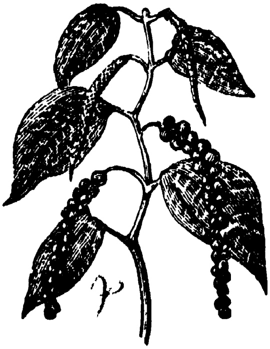


FIG 93 —PEPPER.

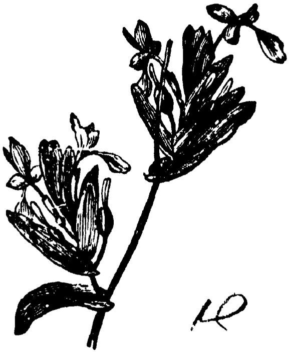


FIG. 94 —CARDAMOM

Cardamom (*Bari ilaichi*, *Yelakki*) is a native of the south-west coast, and grows on the hills in Malabar, Kanara, Mysore, Coorg, and Travancore, and in the Palni hills. The plant has stems about 6 feet long, on which the flowers and capsules grow. The fruits are white, having a thick skin, with small black seeds inside. The trees are grown in clearings in the forest. The capsules are picked before they are fully ripe and dried in the sun for four or five days. The seeds are used in sweatmeats and cakes, and chewed with betel and nut.

Cinnamon (*Dārchīni*, *Lavanga*) is the aromatic bark of a tree that grows wild in the Western Ghats, and is also cultivated. The tree is cut down close to the ground when it is six years old and straight long shoots spring up from it. The shoots are cut and the bark is peeled off and dried in the sun. The plant also yields three kinds of oil. From the bark cinnamon oil is made, from the leaves "clove oil" is made, and the roots yield a yellow oil that smells like camphor. The bark is used as a spice to flavour food, especially *pillaus*, and also as a medicine.

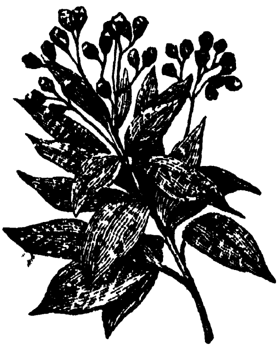


FIG. 95 —CINNAMON

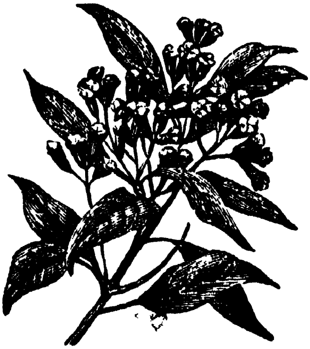


FIG. 96.—CLOVE.

The *Clove* (*Lavanga*) is mentioned in the Ramayana. Cloves are the dried unopened flower-buds of the tree. They are picked when the bud, which is at first green, turns bright red, and are then dried in the sun. The wild tree is a native of Malabar. It is used as a spice to flavour food, and from it the "oil of cloves" is made, and is much used in making scents.

The *Nutmeg* (*Jaiphal*) and *Mace* (*Jati*) are both produced by an evergreen tree, native to the Moluccas and cultivated in India on the Nilgiri Hills. Several varieties of the nutmeg tree grow wild in the Western Ghats. The fruit yields the nut known as nutmeg. *Mace* is the outer covering of the nut. It needs hot damp climate. The nuts are allowed to fall to the ground, and are then collected. The nut is grated into powder when used as a spice to flavour food. It also yields a valuable oil, used as a medicine and in making scents. Nutmegs are also imported from the Straits Settlements and re-exported to Europe.

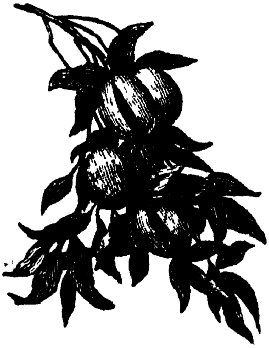


FIG. 97.—NUTMEG.

GARDEN CROPS.

Garden crops consist of vegetables and edible roots. They are grown all over India, many of them in gardens near large towns. They are chiefly ginger (*adrak*), turmeric or saffron (*haldi*, *mañjal*), chillies (*mirch*), onions (*piyāz*), and garlic (*lasan*). These are used chiefly as condiments to flavour food. They are also exported. The value of the chilli export is over 12 lakhs.

The edible roots and vegetables are potatoes (*alu*), yams (*chupri ala*), briñjal (*baigan*), and radish (*mūli*).

Fruits are also grown in gardens. The most common and most useful is the banana or plantain. The mango is considered to be the finest fruit in India. The best mangoes are considered to be those of Bombay. Other well-known fruits are the orange, lime, shaddock or pomelo, fig, papaw, custard apple, guava, melon, pineapple, and grape. On the hills and in Kashmir many kinds of fruits are grown which have been brought over from Europe, *e.g.* apples, pears, plums, and strawberries.

MINERALS.

The most important and valuable minerals found in India are gold, coal, salt, saltpetre, and petroleum. Others of less value are rubies, mica, manganese, jade, and iron ore.

Coal.—There are several coal-fields in India, but the coal is far poorer in quality than that found in England and Wales.

The most important coal-fields are in Bengal, Chota Nagpur, and Orissa. Another large field is in the Central Provinces, and a third in Hyderabad. The chief Bengal coal-field is in Raniganj, that in the Central Provinces is in Warora, and that in Hyderabad in Singareni. There are newer fields in the north east of Assam, in Makum, and in Burma, in the Northern Shan States. The coal from the Indian mines is being used more and more on the Indian railways. The export too is increasing, and is now worth about 150 lakhs out of a total value of 1012 lakhs raised.

Gold is found chiefly in Mysore in the Kolar mines which are among the richest in the world. The mines have reached a depth of over 3000 feet. Another very rich field lately discovered is in Anantapur, a Madras district, close to Kolar. Gold to the value of about 2256 lakhs was raised in 1919.

Salt is produced in large quantities in India in two ways. It is obtained by evaporation from sea water by the heat of the sun's rays, and by mining rock-salt. The Salt Range of hills in the Punjab contains beds of salt 500 feet thick. There is another great field in the North-West Frontier Province in Kohat. The Sambhar Lake in Rajputana yields a large quantity of salt by evaporation. The value of the salt obtained in 1919 was about 183 lakhs.

Mica mines are found in Bihar and in the Nellore district of Madras. More than half the world's supply of mica comes from India. The value of this mineral obtained in 1919 was about 86 lakhs.

Petroleum, or Kerosene oil, is found in North-east Assam, in the Makum field and in Burma, in the Irrawaddy Valley, in the Arakan Yomas. The use of this oil has spread all over India. It is sold in every bazaar. Large quantities are imported. The value of the oil raised in India in 1919 was about 183 lakhs.

Rubies are found in mines in Upper Burma where the yield in 1919 was worth 10 lakhs. *Jade* also comes from Upper Burma, the yield being worth about 8 lakhs.

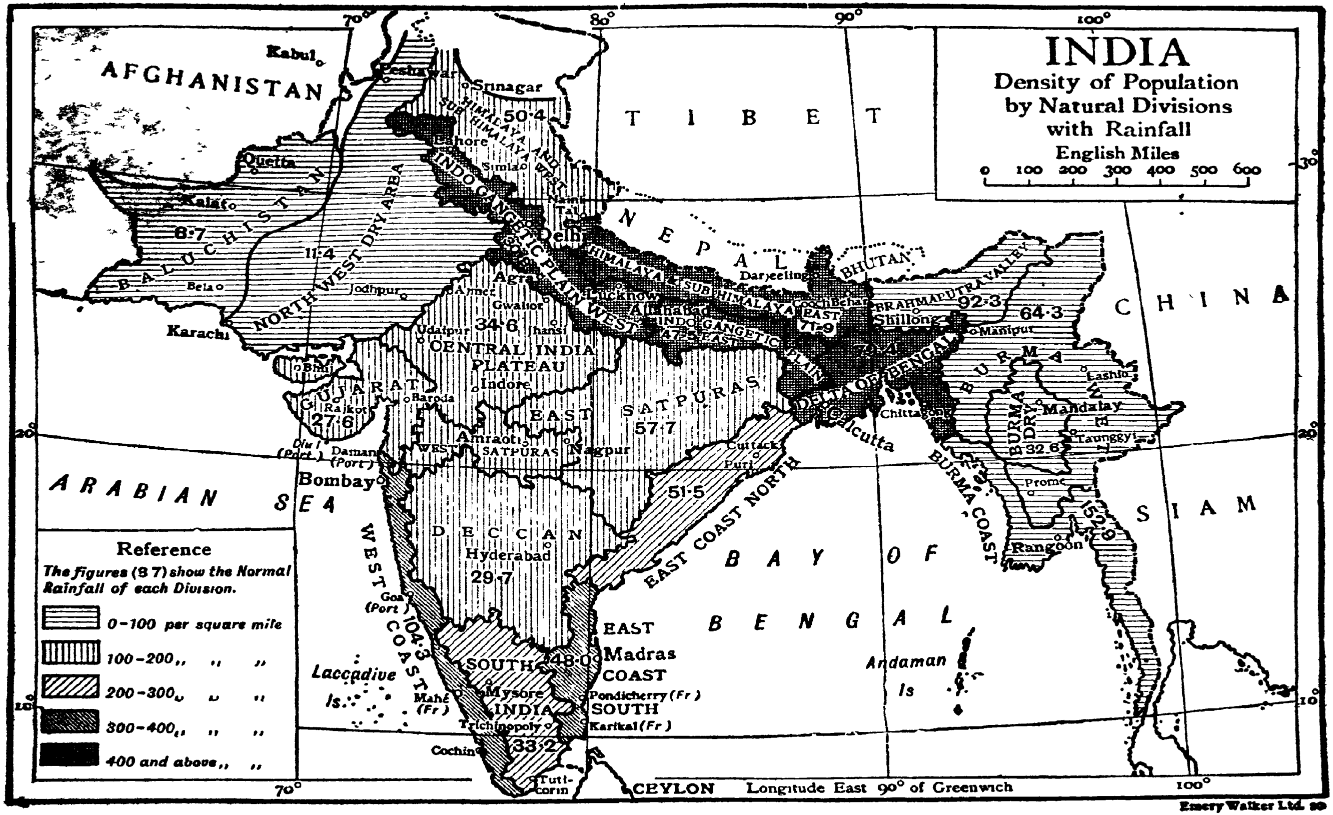
28. INDIA (*continued*).

RAINFALL AND DENSITY OF POPULATION.

THE Rainfall in India and the Monsoons were described in Lesson 26. This lesson connects the density of population with the rainfall, for the former depends very much on the latter.

The map shows the *Mean annual rainfall* in inches, in each of the natural divisions of India, these divisions being made in accordance with the rainfall only. For example, the figure 8·7 in Baluchistan means that the mean rainfall there is $8\frac{7}{10}$ inches in the year. In the delta of Bengal it is 79·4, *i.e.* $79\frac{4}{10}$ inches. On the west coast it is $104\frac{3}{10}$, and so on. The highest figure is 152·9 in Lower Burma. Each of these figures is an average, made up from the returns from many different stations in the division.

The *Density of the population* in each of the rainfall divisions is also shown in this map by shading, as may be seen in the *Reference* below it. The darker shades show the denser population. The greatest density is in the great plains of the Ganges, where there are 400 inhabitants to the square mile. Next to it comes the alluvial west coast plain, where there are from 300 to 400. As a general rule it will be found that high or low density of population goes with heavy or light rainfall. But other factors affect the population as well. The population is dense in the western part of the Ganges valley where the rainfall is only 30 inches, but here there are a great many canals which supply water for irrigating the fields and thus providing for many people. In Chota Nagpur, in the eastern Satpura division, the rainfall is good, being $57\frac{7}{10}$ inches, but the soil is poor and stony and the population not dense. The Tarai at the foot of the Himalayas has heavy rainfall, but the climate is very feverish and unhealthy and very few people live there. Most of Burma has good rainfall, but until lately the government was bad and people could not live there in comfort. Good government has led to an increase in the population, especially in the large towns on the coast.



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29. INDIA (*continued*).

GOVERNMENT.

THE Indian Empire is a part of the British Empire. It includes **British India**, which is directly ruled by His Majesty the King-Emperor; and the **Native States**, which are under British protection and are sometimes termed Protected States.

The administration of the Indian Empire in England is under a member of the British Cabinet, styled the *Secretary of State*, who has a council to assist him. The supreme authority in India is the *Governor-General in Council*, often styled the Government of India. The Governor-General is also called the Viceroy. He has two councils to assist him, the Council of State and the Legislative Assembly. He has also an *Executive* Council consisting of eight Heads of departments.[1]

British India is now divided into fifteen provinces (including Delhi). The names of these provinces, the number of districts in each, its area in square miles, and its population at the last census, taken in 1921, will be found in Appendix II. Madras, Bombay, and Bengal are Presidencies. In each of them there is a *Governor* with an Executive Council.[1]

There are five *Governors* in the United Provinces, the Punjab, Assam, the C. Provinces, and Bihar and Orissa. Burma is under a Lieut.-Governor (1921).

There are six *Chief Commissioners* in the N.-W. Frontier Province, Coorg, Delhi, Ajmer-Merwara, Baluchistan, and the Andaman Islands.

There are Legislative Councils in the three Presidencies and the Governorships.

Each of the provinces is divided into districts, the larger provinces having more, the smaller provinces fewer districts. In most provinces the districts are grouped into divisions under Commissioners. At the head of each district there is an executive officer, styled a Collector and Magistrate or a Deputy Commissioner. Under him there are Joint Magistrates, Assistant and Deputy Collectors, or Assistant Commissioners. There are now 267 districts in British India.

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[1] For details see *History of India for Junior Classes*, 1921 (Macmillan & Co.).

In Appendix III. are shown the names of the larger Native or Protected states, their area and population, and the caste or creed of the ruling family. These states are ruled by their own princes, styled Maharajahs, Rajahs, Nawabs, or Chiefs, most of whom have their own ministers and councils. They have their own laws, their own systems of government, and their own revenues. Some of them pay a tribute to the Supreme Government and others do not. They are under the political supervision of a British Resident, or Agent. There are 700 of these states, ranging from Hyderabad with an area of 82,000 square miles and a population of over 13 millions to small states having only a few villages.

The local affairs of every large town, such as concern roads, water-supply, schools, hospitals, vaccination, and so on, are managed by *Municipal* Councils, the members being almost all Indians, of whom about half are elected by the people. They levy taxes, make bye-laws, and spend money. There are 739 of these Municipal Councils. In the villages there are 732 *District* and *Sub-District Boards*, whose duties and powers are much the same as those of Municipal Councillors, and 922 Union Panchayats.

30. INDIA (*continued*).

LANGUAGES.

Five great families of languages have their home in India. These languages, and the number of people who speak them, are:

Aryan—about 233 million.
Dravidian—about 63 million.
Tibeto-Chinese—about 13 million.

Munda—about 4 million.
Mon-Khmer—about ½ a million.

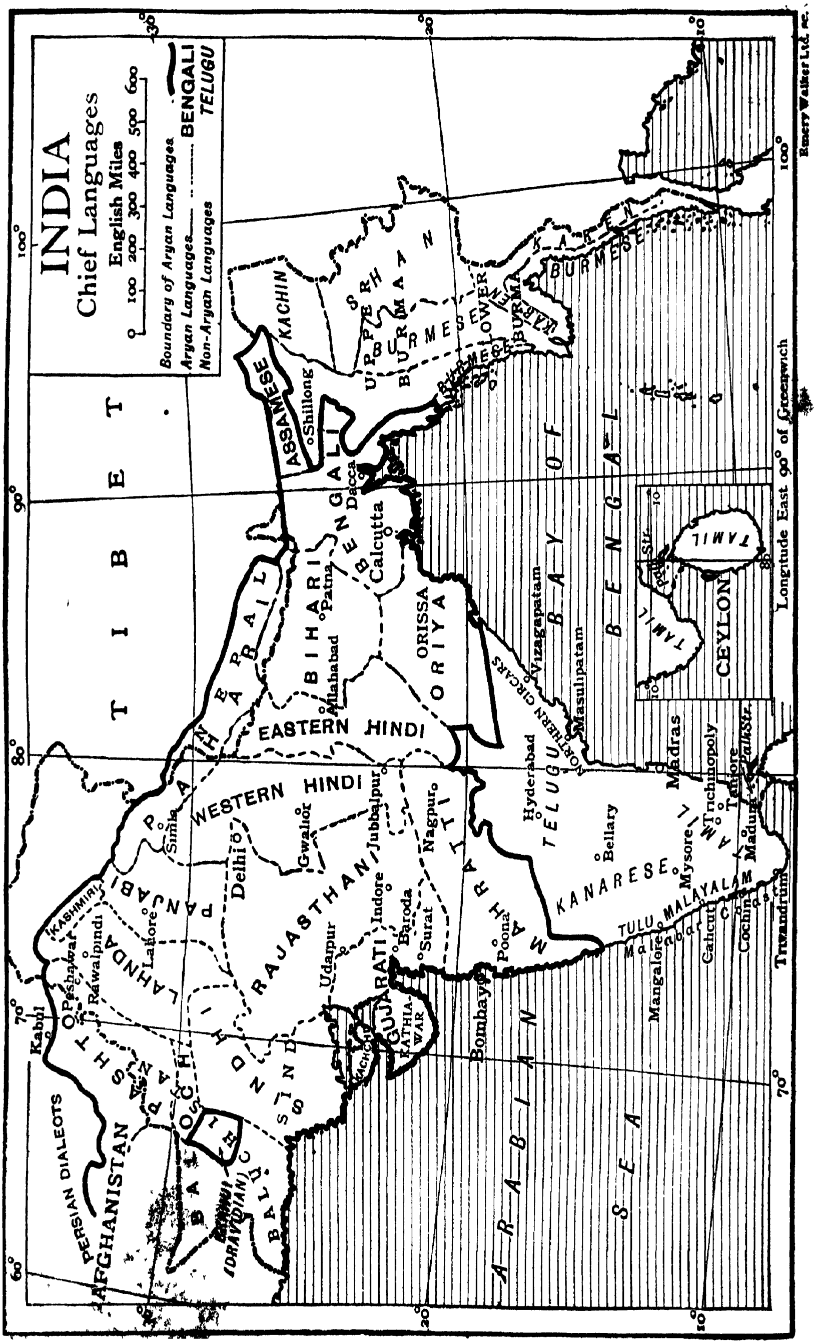
Each of these is a "family" including many different vernacular languages. All those of one family are more or less like one another, and are probably the offshoots of one original language spoken by one people thousands of years ago.

The Aryans were an ancient race belonging to the Caucasian or white race of men described in Lesson 61. The Dravidians probably belonged to the brown or black race, and the Tibeto-Chinese to the Mongolian race. To the same race probably belong the people who speak the Mon-Khmer and Munda languages.

The *Munda*-speaking people were, so far as we know, the first of all these races to live in certain parts of India. They are called aborigines. There are 16 dialects, and the tribes who speak them live in the hills and jungles of Chota Nagpur and Orissa. They are the Santals, Kols, Savaras, Juangs and others. These ancient tribes seem to have fled into the hills and forests of the Satpuras and the Vindhyas from the Dravidians, who at first filled the country, and then from the invading Aryans.

The *Mon-Khmer* is one of the Indo-Chinese group of languages, and the first home of the people who speak it was in China. They came down the valleys of the Chindwin, the Salween, the Irrawaddy and the Brahmaputra, into Burma, Assam, Tibet and Nepal, and in various parts of these countries their descendants now dwell. There are 7 dialects. The most important of the tribes who speak a Mon-Khmer dialect are the Khasis of Assam.

The *Tibeto-Chinese* languages are very widely spread. There are 140 dialects. This group includes two languages, Tibetan and Burman. The Bhutias speak one of its dialects, the people of Sikkim speak another. Other dialects are spoken by the hill tribes of Assam, the Akas, Daflas, Abors, Mishmis, Garos, Lushais, Mikirs, and Nagas; and in Upper Burma, the Kachins. In Manipur another dialect is spoken. The Burmese language, spoken by 7½ millions of people, has many dialects all over Upper and Lower Burma. The Shan is spoken in Assam as well as


INDIA
Chief Languages
English Miles
0 100 200 300 400 500 600
Boundary of Aryan Languages
Aryan Languages .... BENGALI
Non-Aryan Languages .... TELUGU
T I B E T
AFGHANISTAN
PERSIAN DIALECTS
BALUCHISTAN
BRAHUI (DRAVIDIAN)
PASHTO
KASHMIRI
LAHNDA
PANJABI
SINDHI
PAHARI
WESTERN HINDI
EASTERN HINDI
RAJASTHANI
GUJARATI
KATHIAWAR
KACHCHH
BIHARI
BENGALI
ASSAMESE
KACHIN
UPPER BURMESE
LOWER BURMESE
BURMESE
SHAN
KAREN
ORISSA
ORIYA
MARATHI
TELUGU
NORTHERN CIRCARS
KANARESE
TAMIL
MALAYALAM
TULU
Malabar Coast
CEYLON
ARABIAN SEA
BAY OF BENGAL
Kabul
Peshawar
Rawalpindi
Lahore
Simla
Delhi
Gwalior
Jubbalpur
Allahabad
Patna
Calcutta
Dacca
Shillong
Udaipur
Indore
Baroda
Surat
Nagpur
Bombay
Poona
Hyderabad
Vizagapatam
Masulipatam
Bellary
Madras
Mysore
Trichinopoly
Tanjore
Madura
Mangalore
Calicut
Cochin
Trivandrum
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60°
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Longitude East 90° of Greenwich
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Assamese, which is mainly an Aryan language. A Shan dialect is the Karen.

The *Dravidians* were an ancient and civilised people who lived all over India thousands of years ago. They built great cities and cultivated the land. They were short dark men, and are supposed to have been among the first inhabitants of India. They are now the inhabitants of all South India and a large part of the Deccan. Those of them who were in North India seem to have been conquered by the Aryans who came into India after them, to have intermarried with them, and to have been known as Sudras. There was at first one ancient Dravidian language in South India which split up into five great languages and several dialects. These languages are (1) *Tamil*, spoken by 18 millions in the far south and south-east of the Madras Presidency; (2) *Telugu*, spoken by 23½ millions chiefly in the Northern Circars in Madras, the south-east of Hyderabad, and the north of the Carnatic; (3) *Kanarese* or *Kannada*, spoken by 10½ millions in Mysore, Coorg, the south of the Deccan, and in North and South Kanara on the western coast; (4) *Tulu*, spoken by half a million in the northern part of South Kanara; and (5) *Malayalam*, spoken by about 7 millions in Malabar, Travancore, and Cochin.

Of these languages, Telugu, Kanarese, and Tulu are closely related and may be called sister languages. Tamil and Malayalam are also sister languages.

The *Aryans* are supposed to have lived in very ancient times in the wide border-land between Europe and Asia, in the country now called Russia, north of the Caucasus Mountains. Various tribes spread eastward and westward from their native homes into Central Asia and Europe. Wherever they went, they seem to have conquered the old natives and to have mixed with them, forming new nations with new languages. Some tribes came down into India, not all at once, but one after another. They spoke dialects of some very ancient Aryan language. In one of these dialects their sacred books were written. It was called *Sanskrit*. As they mixed with old Dravidian and other tribes whom they found in the country, new languages were spoken, partly Aryan and partly other old Indian languages and were called *Prakrits.* From these Prakrits the present spoken languages of Northern India are derived. The chief of them are shown on the map, in which a thick black line divides the northern countries in which the Aryan languages are *chiefly* spoken from the southern countries in which Dravidian languages are spoken. As Indians travel from place to place and often settle down in countries far from their native homes, it will often be found that many different languages are spoken in a country, particularly in large towns. For example, many Maratha Brahmin families have settled in the Madras Presidency and speak dialects of Marathi in their homes, but outside they talk Tamil, or Kanarese, or some other Dravidian language. The map shows the *chief* language of the country.

The chief Aryan languages are: Hindi or Hindustani, spoken by 82 millions; Bengali by 48½ millions; Marathi by 20 millions; Punjabi by 16 millions; Rajasthani (the languages of Rajputana) by 14 millions; Western Hindi by 14 millions; Gujarati by 10½ millions; Oriya by 10 millions; Western Punjabi, or Lahnda, by 5 millions; Sindhi by 3½ millions; Eastern Hindi (including Bihari) by 3 millions; Pashtu (the language of the Pathans) by 1½ millions; Assamese by 1½ millions; Western Pahari (the language of the Himalayan hill-men) by 1½ millions; Kashmiri by 1 million.

Urdu is the Persianised form of Hindi. It arose in the times of the Pathan and Mughal emperors and is used by Muhammadans.

Brahui is a Dravidian language spoken in Baluchistan. It is one proof that the Dravidians once occupied Northern India.

31. THE BOMBAY PRESIDENCY.

BOMBAY, the Western Presidency of British India, is divided into four Revenue divisions, each under a Commissioner, and includes many native states. It has an area of about 123,000 square miles, and a population (1921) of 19½ millions, mainly Hindus except in Sind, where it is chiefly Muhammadan. It has the largest imports in India, but in exports stands second to Calcutta.

There are five climatic regions in this Presidency. They are Sind, Gujarat, the Deccan, the Konkan, and the Carnatic.

Sind differs widely from the rest, no less in its climate and physical features than in the language, dress, and customs of its inhabitants, who are cut off by the sea (*i.e.* the Runn of Cutch) and the desert from the rest of India. Sind is the lower valley of the Indus. It is mostly a flat desert country, except where the floods of the river or the water from canals have changed the dry sand into green fields. It is an almost rainless tract, the rainfall for the whole year being less than 4 inches. The climate is one of great extremes. In one town, Jacobabad, said to be the hottest place in India, the thermometer marks 126° in the hot season. In the cold season it falls below 32°, and water freezes in the plains. The language spoken is *Sindhi.*

Gujarat is a plain watered by many rivers, a striking contrast to Sind. The Narbada and the Tapti flow over the country, which has the richest soil and the densest population in Bombay. As to the climate, Gujarat has a brisk cold season, but it is very hot in the hot season. The rainfall is about 25 inches. The map shows that nearly the whole of Gujarat is included in protected states, the chief being Baroda, Cutch, and Bhaunagar. Baroda, however, is not politically connected with Bombay. The language of Gujarat is *Gujarati.*

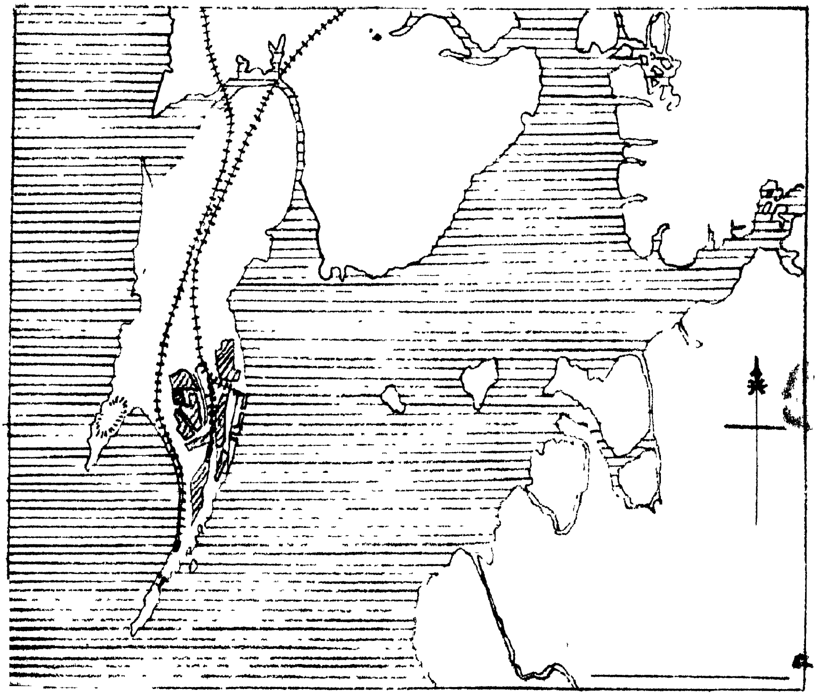
The (Bombay) **Deccan** is the upland of the Ghats, here called the Sahyadris. It is an almost treeless plateau sloping eastward from the rocky edge of the Ghats towards the level fields of Berar and Hyderabad. The Ghats, which receive a heavy rainfall on their scarp, *i.e.* the steep western cliffs, shut out the rain from the slope on the east, so that most of the Deccan gets scarcely any rain; the land is dry and famine often visits it. Near the Ghats, however, there is a moderate rainfall of 20 to 30 inches, some of which comes from the monsoon in October. Only in the valleys do we find busy towns. The climate has produced a race of sturdy, hardy Marathas. Close to the Ghats, where there is a fair rainfall, the main crop is rice, grown in terraces on the sides of the hills; where the ground is level, cereals are cultivated. The language of the Deccan is mainly *Marathi.*

The **Carnatic**, or southern Maratha country, is the hilly tract along the Ghats, south of the plateau of the Bombay Deccan. It is a land of "sweeping forests and well-watered fields," which yield good crops of rice. The hills are covered with dense jungle, the trees being often of gigantic size. In the east, over the crest of the Ghats, the rainfall is moderate, but on the western side the monsoon bursts with full force and the rainfall is often 200 inches in the year. In March and April the thermometer sometimes stands at 110 inches, but the air at that time is dry. In the monsoon the climate is cool and pleasant. The language of the people is *Canarese* (*Kanarese*).

The **Konkan** is the low-lying coastal plain, between the Western Ghats and the sea, to the north and south of Bombay. Spurs of the Ghats run down to the sea in many places, and there are countless mountain streams. It is a country where road-making is difficult. The railway, southward from Bombay, does not therefore lie along the coast, but on the upland, along the eastern slope of the Ghats. There are fields of rice and groves of coco-nut trees everywhere; the climate is damp and the air is hot just before the monsoon, when the thermometer often reaches 110°. In December, January, and February, however, the air is cool and the climate pleasant. The language of the Konkan is a dialect of *Marathi.*

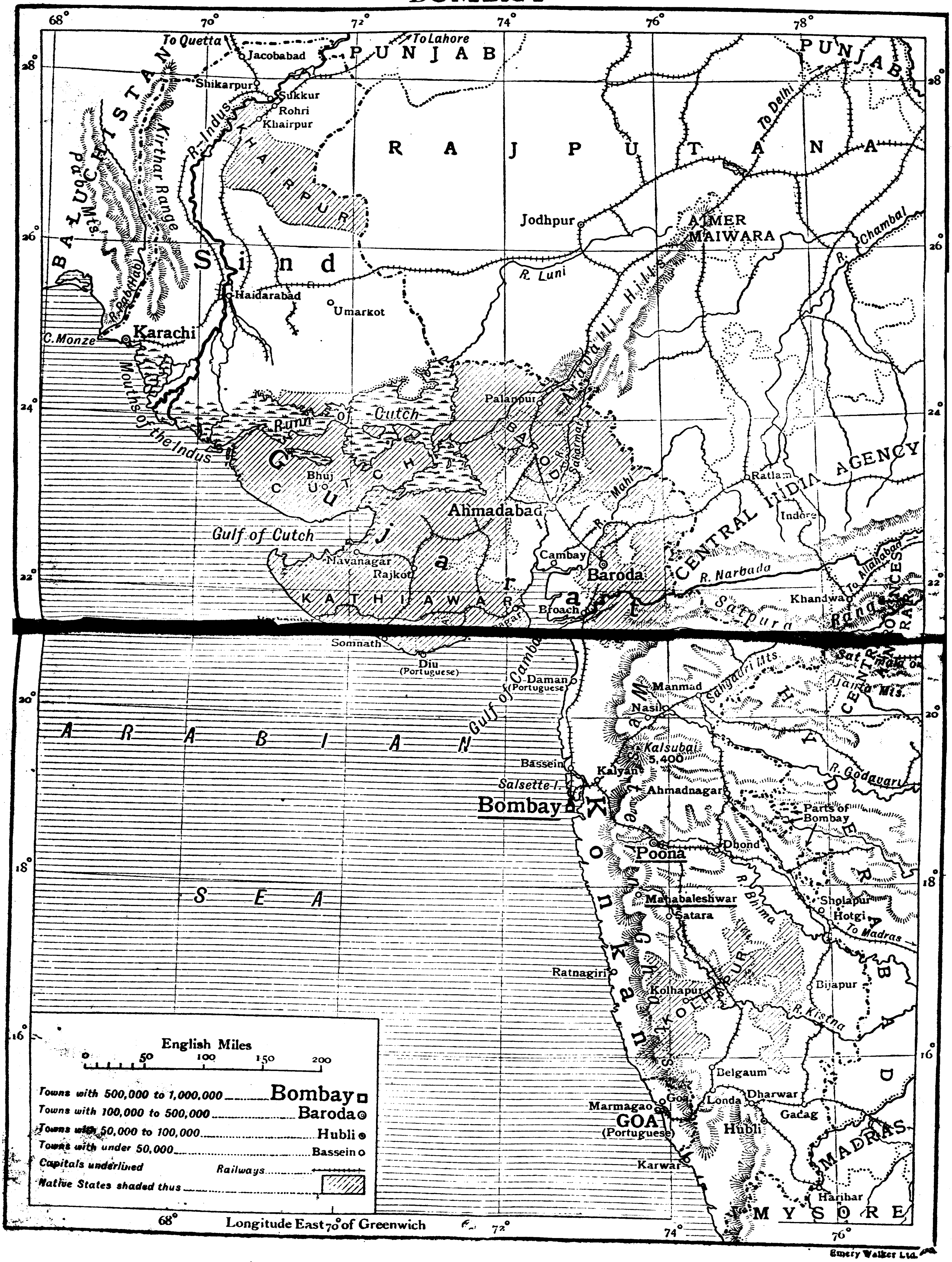
Rivers.—The Bombay Presidency has no great rivers which are wholly its own. The upper courses of the rivers which flow down through its districts are in the uplands to the north and east. The *Indus* flows through Sind in the lower part of its course. Here it has no tributaries. The *Luni* is wholly a river of Rajputana; it flows into the Runn of Cutch. The *Sabarmati* and the *Mahi* (rivers of Rajputana) water Gujarat. The *Narbada* and the *Tapti* also water Gujarat, flowing down into the plains from the Vindhya and Satpura mountains in which they rise. The head-waters of the *Godavari* and *Kistna* are in the Ghats in the Deccan. The former rises near Nāsik, and the latter close to Mahabaleshwar. The *Sharāvati*, which flows down from the Ghats in N. Canara, near Karwar, forms the magnificent *Gairsoppa* waterfalls, the highest in the world, for they have a sheer fall of over 900 feet over the face of a cliff.

The **Railways** of the Presidency, and the chief railway



[illegible], may be seen on the map. There are three great lines. The *Bombay-Baroda* and *Central India* runs north through Gujarat, and connects Bombay with Central India, Rajputana, and the Punjab. The *Great Indian Peninsula* branches off in two lines from Bombay. One runs north-east by Manmad and Jabbulpore to Delhi; the other runs south-east to Poona and Raichore, where it joins the Madras Railway. The *Southern Maratha* runs from Poona southward through the southern districts, to Mysore.

BOMBAY



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CHIEF TOWNS OF THE PRESIDENCY.

(The population in thousands is given by the figures in brackets.)

Bombay (1173), the capital of the Presidency and the chief seaport of Western India, is situated on an island which is connected with the island of Salsette by causeways and so with the mainland. It forms a district by itself. It has a splendid harbour, one of the finest in the world, and many noble buildings. There are docks and a long line of embankments for five miles, for the landing of goods from steamers. The harbour is nearly always filled with ships and steamers and yachts. The lighthouse from Colaba Point (see Fig. 98) can be seen 18 miles out at sea. Malabar Hill, 180 feet high, is covered with large well-built houses, the residences of the "merchant princes" of Bombay, chiefly Parsis. The Apollo Bandar is a landing-place which fronts the bay and has a magnificent view.

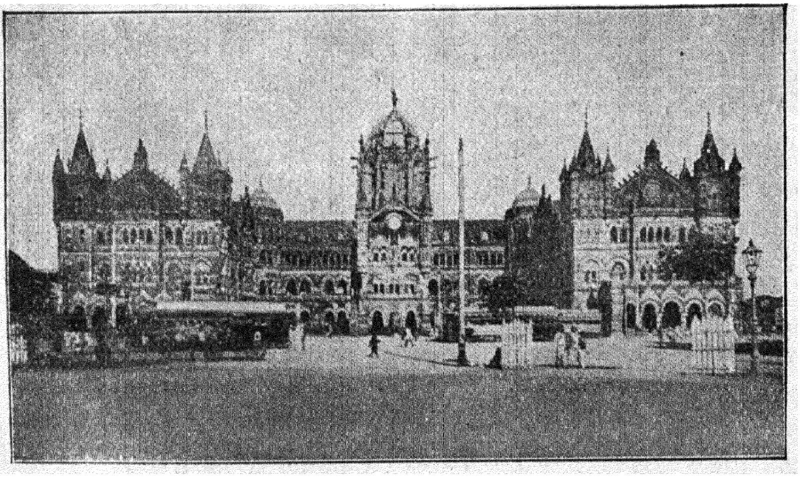


FIG. 99.—VICTORIA TERMINUS, BOMBAY.

Bombay has been called the *Gate of India.* It is the nearest port to Europe (excepting Karāchi), and the point at which mail steamers leave and reach India. Most of the trade from Europe passes through it. It has a large university and numerous colleges. It is the chief seat of the cotton industry in India; for the damp air is very suitable for the weaving and spinning of cotton, and there is a large supply of raw cotton from the black-cotton soil in Gujarat, Birar, and the Deccan. There is much dyeing, metal working, and tanning. There are over 100 spinning and weaving mills. The chief exports are raw cotton, grain, opium, ivory, coffee seeds, and cotton twist and yarn. The chief imports are cotton goods, metals and machinery, and sugar.

The climate is very damp. In June the south-west monsoon breaks, and blows till the end of September. May and October are the hottest months. The average rainfall is 75 inches; the average temperature 79°. The Governor of Bombay and his staff spend the cold season here, but go up to Mahābaleshwar for the hot season, and to Poona for the rainy season.

Poona (177) is 1850 feet above the level of the sea. It is a terminus of the Southern Maratha Railway, 120 miles south-east of Bombay. It is the military capital of the Deccan, and the seat of the Bombay Government from June to October. The annual rainfall is 28 inches, and the mean temperature 70°. Poona was the old Maratha capital of the Peshwas. It is the headquarters of the "Servants of India" Society and the Ferguson College. There are numerous old palaces and temples, and many public buildings. The industries are the weaving of silk and cotton, and the making of brass, copper, and clay pots, also silver and gold jewellery, and articles of ivory. Poona is a great railway centre. Railway trains ascending the Ghat from Bombay at a very sharp turn "reverse," or run backwards, as in the picture (Fig. 100). The mountain peak close by is known as the "Duke's Nose."

Ahmadabad (274), formerly the capital of the Muhammadan kingdom of Gujarat, is still the second largest city in the Presidency, and one of the finest towns in Western India. It stands on the river Sabarmati, about 50 miles from the head of the Gulf of Cambay. It has many splendid mosques and tombs and palaces. It has large cotton mills and dyeing works, and manufactures of silk goods, brocade, shoes, wood-carving, and pottery.

Ahmadnagar, on the Dhond-Manmad Railway, was the capital of the Nizam Shahi kings. It has an old fort. The chief industry is the weaving of sāris or women's cloths, and carpets, and the making of brass and iron pots.

Baroda (95) is the capital of the State of Baroda. It is an important railway station, and has manufactures of cotton goods, carpets, and wood-carving. It is a well-built modern town, with handsome public buildings, hospitals, and schools.

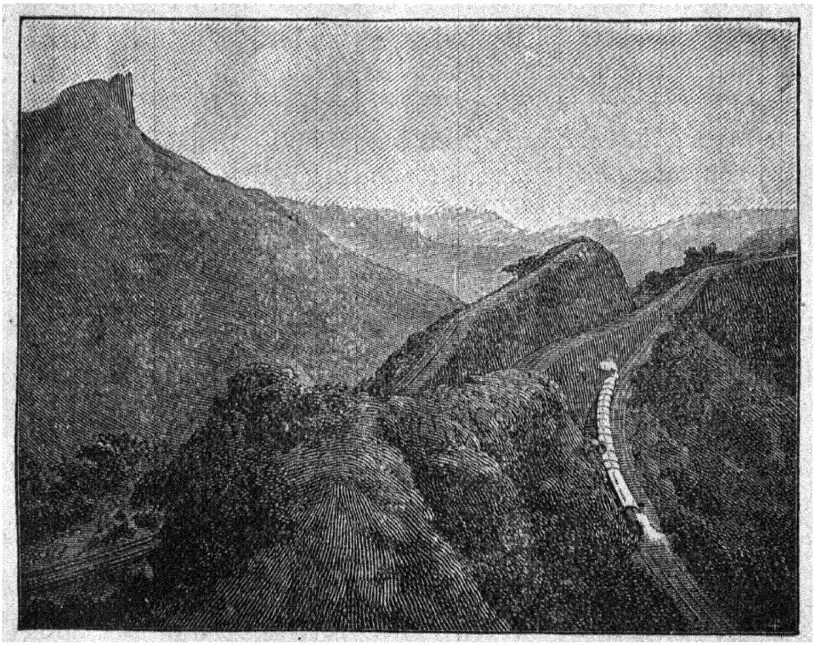


FIG. 100.—REVERSING STATION AND DUKE'S NOSE, POONA GHAT.

Belgaum, in the southern Maratha country, is on the Western Ghats, 2500 feet above sea-level. It has a fort, and is a favourite military station because of its cool climate. In the town there are over 300 hand-looms for the making of cotton cloth. The Commissioner of the Southern Division of Bombay is stationed here.

Bijapur is a famous town, once the capital of the kingdom of Bijapur under the Adil Shahi kings. It has vast and wonderful ruins, the remains of palaces, mosques, and tombs of kings, which attest its former greatness. Among them is the Gol Gumbaz or tomb of Muhammad Adil Shah. It is the largest dome but one in the world.

Broach, in Gujarat, is on the Narbada, about 30 miles above its mouth. It is a very old town, and was a seaport with great trade 2000 years ago. From it trade was carried on between India and Western Asia. The Parsis are said to have settled here in the eleventh century, when they fled from Persia. There are a few cotton mills in the town.

Cambay, at the head of the gulf of the same name, is the capital of the State of Cambay. It is a very ancient town, and was once very wealthy because of its great trade. There is a strong *bore* in the bay, when the tide rises 30 feet. This has probably led to the decay of the town. It is famous for the making of ornaments from agate, cornelian, and onyx, which come from mines in the State of Rajpipla close by.

Dharwar, in the southern Maratha country, is built on the slope of the Western Ghats. It has an old fort of the Vijayanagar kings. It is a centre of the Lingayets, who do most of the trade. There is a district jail in which excellent carpets, cloth, and cane chairs are made.

Diu is on an island in the south of Kathiāwār Peninsula, belonging to the Portuguese. It was once a very prosperous commercial town doing much trade with Arabia and the Persian Gulf, but has fallen into decay.

Goa is the capital of the Portuguese territory of the same name. Old Goa is the metropolis of the Roman Catholics in India. It was at the time of the Portuguese dominion a great and famous city, the chief seat of trade between Europe and India. There were then over 200,000 inhabitants; there are now barely 2000. It has the tomb of Saint Francis Xavier, highly venerated by Roman Catholics. Near Goa there is the port of **Marmagao**, which is the terminus of the Portuguese railway which connects with the Southern Maratha Railway.

Haidarabad, or **Hyderabad** (76), was the old historical capital of Sind before the transfer of the capital to Karāchi. It is on the River Indus, and has an ancient fort and the tombs of the old Amirs or Mirs of Sind. It is a good example of a nodal town, as the map shows. Railways, roads, telegraphs, all centre in Haidarabad. There is a large garrison stationed here.

Hubli (61) is a large city on the Southern Maratha Railway. It is the centre of the cotton trade of the southern Maratha country. There is a large trade in raw cotton and silk, copper vessels, grain, and salt. There are several cotton mills and cotton presses. It is a military station.

Karāchi (216), the capital of Sind, is a very large and important seaport, about 1000 miles by rail and 500 by sea north-west of Bombay. It is the terminus of the North-Western Railway, and the "gateway" through which the trade of the Punjab and of a part of Central Asia passes. Karāchi is on a bay formed by a reef of rock 10 miles long which shuts out the sea on the west. It has a good harbour, with wharves 3 miles long, for the landing of goods. There is a well-built modern town with many public buildings, churches, schools and hospitals. The climate, owing to the sea-breezes during eight months in the year, is the healthiest in Sind. The annual rainfall is only five inches. The town, its harbour, and its commerce have all been made since Sind was taken under British rule. The exports are huge quantities of wheat, grown in the Punjab, and other food grains and oil-seeds. There are very large imports of manufactured articles for the supply of the towns in the Punjab.

Kārwār is a seaport town on a beautiful bay about 300 miles south of Bombay. For centuries it has been an important place for commerce. There was an East India Company's factory here, which exported the finest muslin in India and large quantities of pepper and spices. It has lost its former importance; but owing to the fact that it is the only safe harbour during all seasons of the year, between Bombay and Cochin, there is still a good deal of trade.

Khairpur, the capital of the Khairpur State in Sind, is on a canal about 15 miles east of the Indus. The population is largely Muhammadan. It was a large town in the time of the

Talpur kings of Sind, but is now small and unimportant. The industries are the dyeing of cloth and the making of swords and firearms.

Kolhapur (48), the capital of Kolhapur State in the southern Maratha country, has handsome public buildings. It is a very ancient town, with inscriptions dating back to the 3rd century B.C. There is a great temple to the goddess Mahālakshmi, built in very ancient times. The town is connected by a State railway with the Southern Maratha line.

Mahābaleshwar, the chief sanitorium or hill-station of the Bombay Presidency, is at a height of about 4500 feet on the Western Ghats. It is a very pleasant place in the hot season, but the rainfall in the monsoon makes it uninhabitable. The favourite season is from March to June. The mean temperature is 67°; the average annual rainfall is nearly 300 inches.

Nāsik is a Hindu sacred town on the G.I.P. Railway, 107 miles north-east of Bombay. It is on the River Godavari, and it is said that Rama and Sita once lived here. Great numbers of pilgrims visit the holy spot during the year. There are many old Buddhist caves, over 2000 years old, with ancient inscriptions on them, that are very valuable. In brass and copper work Nāsik ranks first among the towns of the Presidency.

Navanagar or **Jāmnagar** (45) is the capital of the state of the same name in Kathiāwār, about 300 miles north-west of Bombay. It is a flourishing town, nearly 4 miles in circuit, with a large trade. The dyeing is famous. Incense and perfumed oils are made.

Rājkot (36), capital of the State of the same name in Kathiāwār. Here there is a well-known Rājkumār college for the education of the sons of rajahs. The Political "Agent to the Governor" is stationed at Rājkot.

Ratnagiri is a seaport town with a fine lighthouse about 140 miles south of Bombay. There is, however, no harbour. There is a heavy surf so that boats can only enter at high tide. There is a large fishery in the sea outside the surf. The exports are fuel, fish, and bamboos.

Sātāra (26), in the southern Maratha country, is on the River Kistna. It has a strong fort on a hill. The city is 2300 feet high and the climate cool and pleasant.

Somnāth is a very ancient city on a bay in the south-west of the States of Kathiāwār. There is a very old historic temple, sacked by Sultan Mahmud of Ghazni about 900 years ago. Krishna is said to have died here. It is now a city of graves and ruins.

Surat (118), on the Tapti, 14 miles from its mouth and about 170 miles north of Bombay, was once the capital of a Presidency under the East India Company, and the chief commercial city of India, with a population of nearly a million. Most of its trade has gone to Bombay. It is still a large and important city, the third largest in the Presidency, with many cotton mills, cotton gins and presses, rice and paper mills, and manufactures of fine cotton and silk brocades. From Surat is exported most of the cotton grown in the Tapti valley.

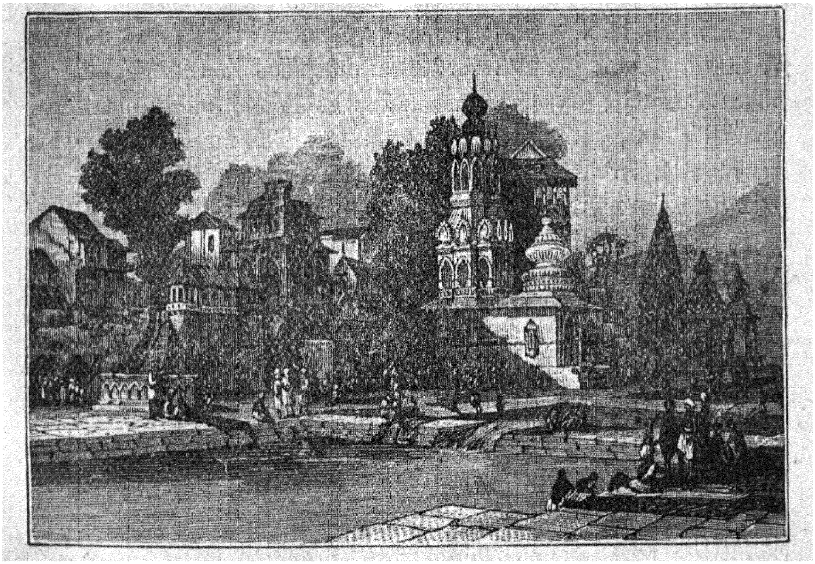


Fig. 101.—Nasik on the Godavari.

32. THE MADRAS PRESIDENCY.

Madras, or the Presidency of Fort St. George, is the southernmost province of British India. Including the native states of Hyderabad, Mysore, Travancore, and Cochin, and the tiny province of Coorg, it occupies all Southern India and a large part of the Deccan, from about 8° to 19° N. latitude. On the east, west, and south there is the sea.

The area of the Presidency alone is about 142,000 square miles, or 20,000 square miles more than that of the whole of the British Isles. The population is about 42½ millions.

Mountains.—Along the whole length of the western coast, at a distance from the sea of from 50 to 100 miles, and in places much closer to it, runs the range of the **Western Ghats.** Their average height is 4000 feet, and in many places they rise to 6000, 7000, and 8000 feet. The only break in this long line is an opening known as the Palghat Gap in Malabar, about 15 miles wide.

The **Eastern Ghats** run down the eastern coast, but at a greater distance from the sea. They are much lower than the Western Ghats, and there are many gaps through them made by river valleys which divide them into short ranges or groups, with different local names.

We have thus, roughly, five great natural regions in the Presidency: (1) the coastal plain on the east; (2) the coastal plain on the west; (3) the country on the Western Ghats; (4) the country on the Eastern Ghats; (5) the plateau in the middle, between the Eastern and Western Ghats.

The factors of climate (see Lesson 57) show that the climate of the two coastal plains is maritime: that of the country on the two mountain ranges varies according to the altitude, but is on the whole that of the Cool Temperate zone and rainy; that of the central plateau is more or less extreme.

The coastal plain on the west is the Malabar Coast; the eastern plain is called the Northern Circars down to about the Kistna and a little below it; the southern plain is the Carnatic; the central plateau is the Deccan.

All the large rivers in Southern India rise in the west and flow eastward into the Bay of Bengal. A large number of mountain streams flow down from the Western Ghats into the ocean on the west, but these can hardly be called rivers. The Western Ghats are much higher than the Eastern, so that the whole Presidency slopes from west to east. This the map shows by the direction in which the rivers run.

The chief rivers are the Godavari and the Kistna, which water Hyderabad in their upper and middle courses and the Northern Circars in their lower course. The Pennar, Palar, and southern Pennar, or Ponnar, water the northern half of the Carnatic. The Kaveri and Vaigai are the rivers of the southern Carnatic.

There are no lakes in the Presidency properly so called. The Chilka and Pulicat Lakes in the eastern coastal plain are mere salt-water lagoons. The Colair Lake, between the deltas of the Godavari and Kistna, is a hollow which is fast being filled up by the earth brought down by the two rivers.

The Presidency has 1700 miles of coast, but no good harbour for large vessels at all seasons of the year. There is an artificial harbour at Madras. At Cochin there might be a splendid harbour, but the tides have built up an enormous *bar*, or huge bank, at the entrance of the deep backwater, and this cannot be crossed by large ships.

The chief languages of the Presidency are five in number. On the west coast the people speak *Tulu*, and *Kanarese* in the north, and *Malayalam* in the centre and south. Kanarese is also spoken in Mysore, in the south of Hyderabad, and in the country between the two, the western part of the district of Bellary. In the Northern Circars, *Telugu* is the language spoken, and in the Carnatic, *Tamil*. In the east and south of the Deccan, Telugu is spoken; in the west, Marạthi and Kanarese. Urdu is the language of Muhammadans in the Deccan. But the Muhammadans in Malabar, called *Mappilas*, speak Malayalam, and those on the Coromandel Coast, known as *Labbays*, speak Tamil. Both of these classes are the descendants of Arab traders who married women of the country. They speak the language of their mothers.

Madras being the oldest of the Presidencies, education is more advanced there than in any other province: Mission Societies, Roman Catholic and Protestant, opened schools for the teaching of English at a very early period. The knowledge of English is more widely spread in Madras than in any other part of India, and there are many more Christians. There are a good many colleges, a large number of secondary schools, nearly all with good houses and qualified masters, and a very large number of primary schools, District Board, Municipal, Mission, and private. The education of girls is well looked after, and there are numerous girls' schools all over the Presidency.

CHIEF TOWNS.

(The population in thousands is given by the figures in brackets.)

Madras, the capital of the Presidency and the third largest city in India, occupies a strip of land 9 miles long, from 2 to 4 miles broad, and 27 square miles in extent, on the eastern coast-plain in N. latitude 13° 4′ and E. longitude 80° 15′. The population is about 522,000, being about two-thirds of that in Bombay and three-fifths of that in Calcutta. It is "a city of distances." It was founded in the year 1639 and is the oldest Presidency city.

Fort St. George is close to the sea, and its guns command the roadstead. To the north lies George Town, the commercial centre of the city opposite the harbour. There are several lines of banks and merchants' offices here, and behind them is a very thickly peopled tract. There are three large railway stations, as Fig. 102 shows. Of these, two belong to the Madras Railway, which has one line connecting the city with Bombay and another connecting it with Calcutta. A third is the South India Railway, which runs southward to Tuticorin. The Buckingham Canal runs through the city from the south to the north.

The climate is always warm, but equable and healthy. In the cooler months the average temperature is about 76°, and in the hot season about 90°. The mean for the year is 83°. The average annual rainfall is 49 inches, of which about 30 fall in the N.E. monsoon, and about 19 in the S.W. monsoon, from June to September. The language chiefly spoken is Tamil, but one-fifth of the Madrasis speak Telugu.

The chief industries are silk and cotton weaving, silver work, and embroidery. There are also large cotton mills, iron foundries, and cigar factories. The exports are hides, skins, cotton goods, raw cotton, and indigo. The imports are cotton piece goods and yarn, iron and steel goods, machinery, and kerosene oil.

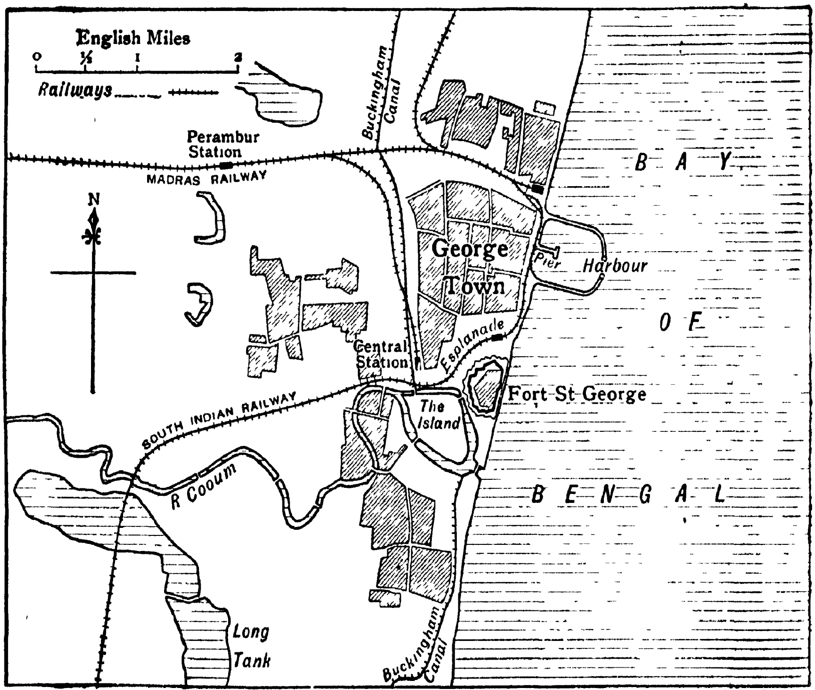


FIG. 102.—MADRAS TOWN AND HARBOUR.

The harbour (shown in Fig. 102) consists of two masonry breakwaters, each 500 yards from a central pier, running out 1200 yards into the sea. They then bend towards each other, leaving an entrance of 500 yards. The light, from the lighthouse on the main tower of the High Court, may be seen 20 miles out at sea.

Kumbakonam (65), on the River Kaveri, one of the oldest cities in Southern India, is a stronghold of Brahmanism and a great educational centre. It has been called the "Cambridge of Southern India." It is the sixth city in the Presidency in size. The chief manufactures are vessels of bronze, brass, copper, and lead; silk and cotton cloths, sugar, indigo dyes, and pottery.

Bellary (35), 1400 feet above the sea. It stands in a wide plain of black cotton soil. It is connected by rail with Madras. It lies at the foot of a strong fort on a rock 2000 feet high. It is a military station, and is noted for its dry and healthy air. There are cotton presses and mills in the town.

Calicut (82) is a seaport town on the Malabar Coast, but it has only an open roadstead and no harbour, so that ships cannot approach it. It is the fourth largest city in the Presidency, with very large trade. It imports grain and salt, and exports coffee and copra. There are large tile-works, coffee-curing works, and an oil mill. The climate is damp and hot.

Vellore (43), on the Palar, an inland town on the railway, has a strong well-built fort with a temple on it with very fine old carvings in stone.

Ootacamund (19), a town on the Nilgiri Hills, is the headquarters of the Madras Government in the hot season. It is on the Nilgiri plateau, 7500 feet above the sea. Ootacamund is the chief sanitorium in Southern India. **Dodda-betta** (Big-Hill), 8760 feet high, is the highest peak on the Nilgiris. All the English flowers flourish in "*Ooty*," as it is often called, in the "soft half-English Nilgiri air." The rainfall is 49 inches. Visitors from all parts of India come here in the hot season.

Tanjore (60), in the delta of the Kaveri, is an ancient town, and was the capital of the Chola kings, the Naik kings, and Maratha kings successively. It is now the eighth town in the Presidency in population. It is full of temples. It is famous for its workers in metal, silk-weaving, jewellery, and lace, and for the make of musical instruments. Tanjore musicians are considered the best in the Presidency.

Trichinopoly (120), on the Kaveri, is the third largest city in the Presidency. It is a very ancient Dravidian town, founded more than 2000 years ago. It was for a long time the capital of the Chola kingdom, and afterwards of the Naik kings. It is now a military station. It lies at the foot of a great rock

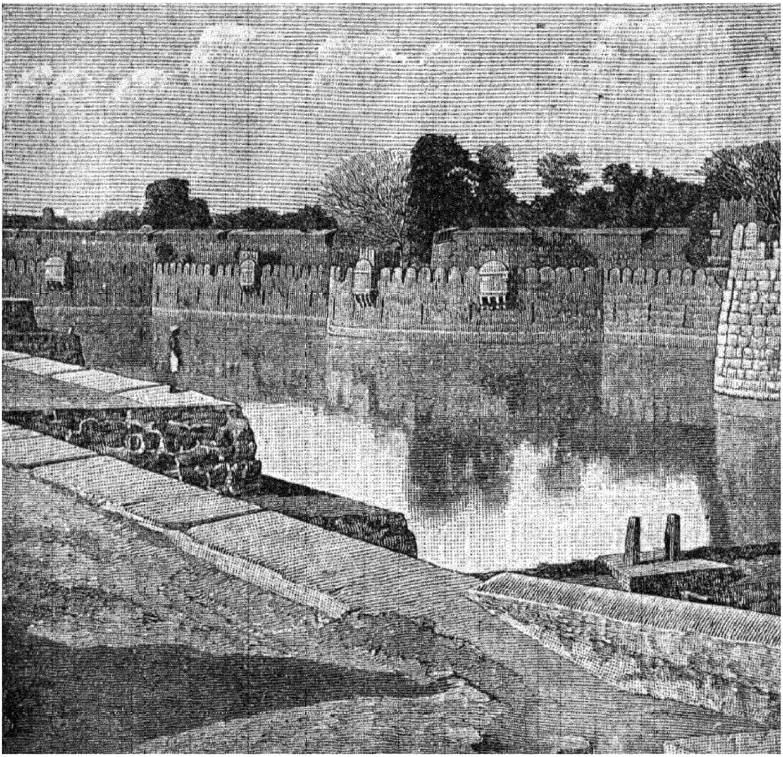


FIG. 103 —VELLORE FORT.

which rises 273 feet above the plain and is known as the "Rock of Trichinopoly." On it there is a very strong fort.

Pondicherry (25), a seaport town south of Madras, is the capital of the French Settlements in India. The Governor resides here. French is spoken by the natives. The port is an open roadstead with no harbour. The main industry is weaving. The imports are chiefly wines and spirits; the exports are ground-nuts, and oil made from them, coco-nut oil, and rice.

Rajahmandry (36), on the Godavari, lies above the delta where the railway crosses the river over a bridge nearly 2 miles long.

Madura (139), on the River Vaigai, is the second largest town in the Presidency. It is a very ancient city full of temples. The chief industry is silk-weaving. There are also cotton mills.

Mangalore (44) is a seaport on the Malabar Coast. It is an open roadstead with no harbour. It has good printing presses, tile factories, and coffee-curing works, and the exports are coffee, salt fish, spices, and areca nuts. It is the terminus, on the western coast, of the Madras Railway, which runs up the coast from Calicut.

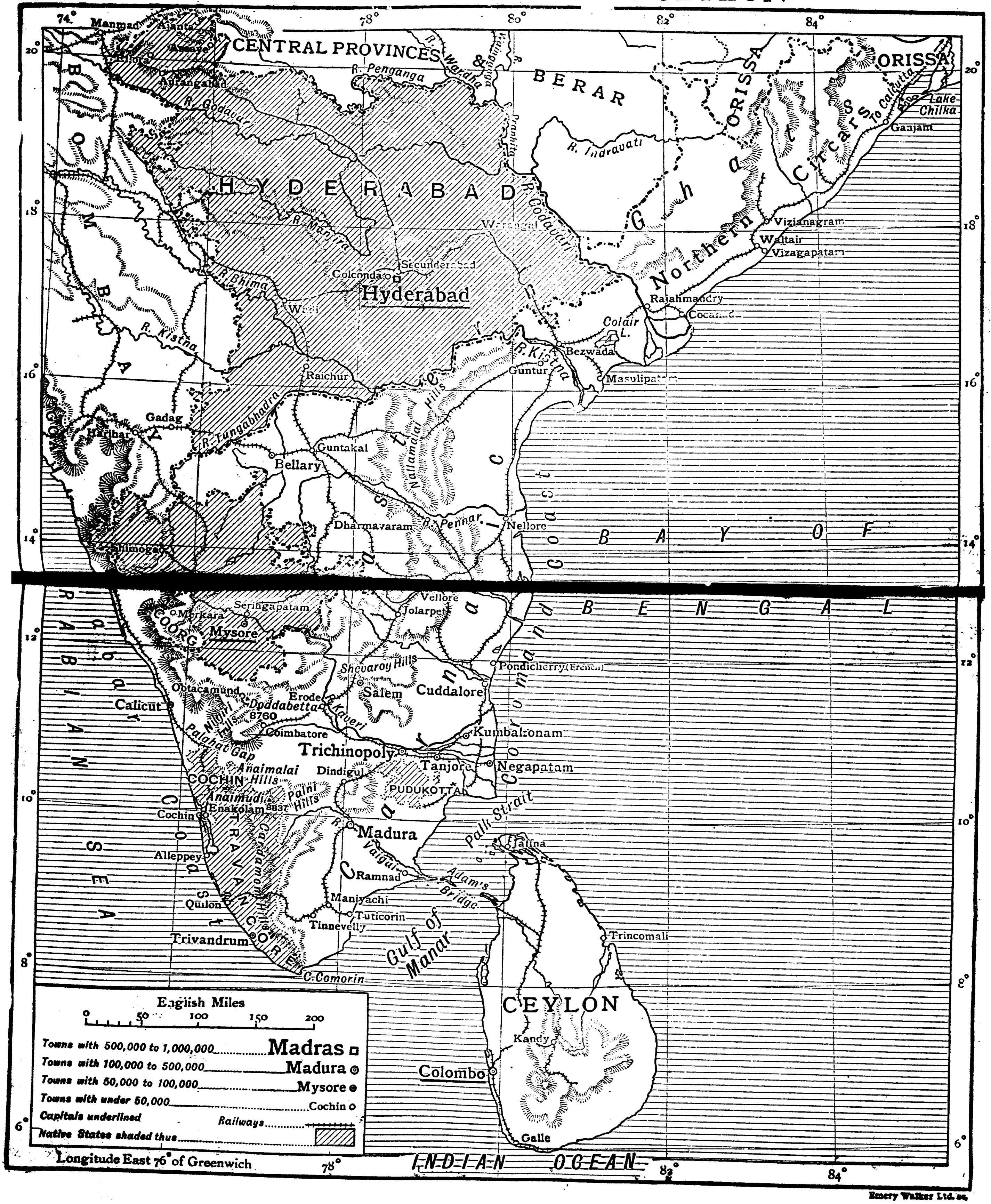
Tuticorin (28), the second seaport in the Presidency, is the southern terminus of the South Indian Railway, and the sixth port in all India as regards the value of its trade. It has a well-sheltered harbour, which is, however, so shallow that large vessels anchor outside, and goods and passengers are taken to and fro in large boats. The importance of Tuticorin is partly due to the fact that it is the point of departure for steamers to Colombo to catch the great ocean steamers to Europe.

Vizagapatam (41) is a seaport which lies in a bay formed by a headland known as the Dolphin's Nose. Close to it, on a hill about 1000 feet high, is the pleasant station of **Waltair**, noted for its coolness. The chief industry is the making of boxes and ornaments of ivory, horn, and tortoise-shell.

Cochin (20), in British Cochin, is the chief port on the Malabar Coast, and the third in the Presidency. It is situated on a magnificent backwater with islands, on one of which stands the British Residency. Cochin was once a Portuguese and afterwards a Dutch settlement, and to this day many descendants of these early settlers live there. The chief exports are coco-nuts, oil, and coir. There is also tea from Travancore, and salt fish.

Masulipatam (40), a seaport town on the Coromandel Coast, is connected by rail with Bezwada junction, and so with

MADRAS PRESIDENC & CEYLON



Emery Walker Ltd. sc.

Madras. The only industries are the making of printed cloths called chintzes, and tanning.

Cocanada (48), the chief seaport on the Coromandel Coast north of Madras, from which it is distant about 400 miles, is near the mouth of the Godavari. The chief exports are cotton, oil-seeds, rice, tobacco, and ghi.

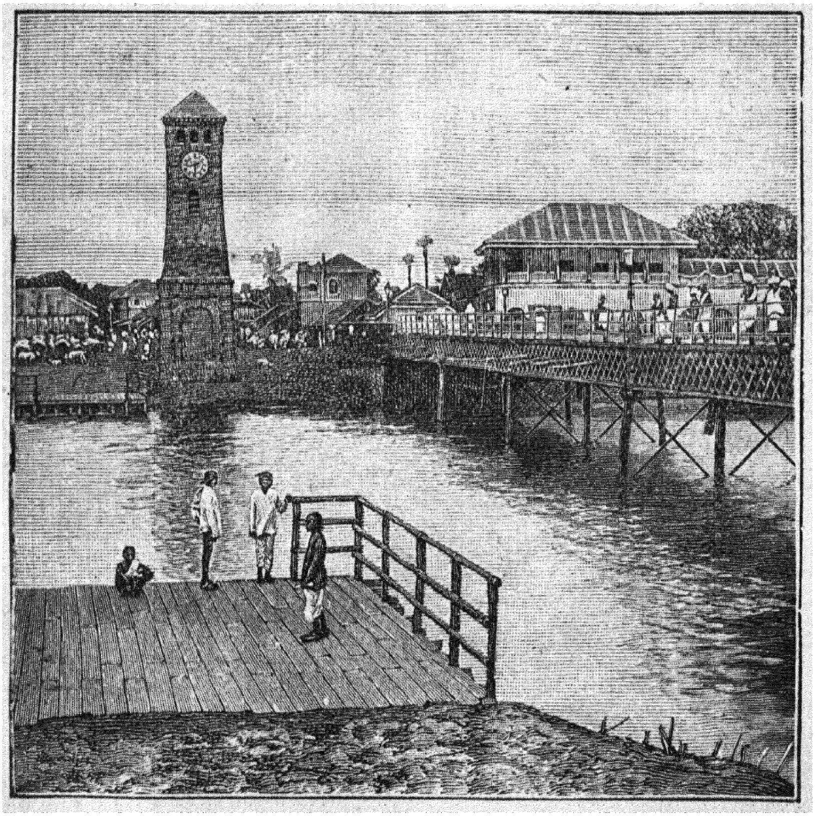


FIG. 104.—COCANADA.

Coimbatore (47) is a large town at the foot of the Nilgiri Hills. It is a very favourite station, for it stands in the Palghat Gap, is 1300 feet high, and enjoys the breezes from the western ocean. The temperature is moderate, and the climate healthy. There are cotton presses and spinning mills, a tannery, and coffee-curing works for the coffee that grows on the Nilgiris.

HYDERABAD.

Hyderabad (Haidarabad), the largest Protected State in India, is about 83,000 square miles in extent. It has a population of about 13½ millions.

The country is a great plateau in the centre of the Deccan with an average height of 1250 feet above sea-level. On it rise rocky hills from 2500 to 3500 feet in height. It has two natural regions.

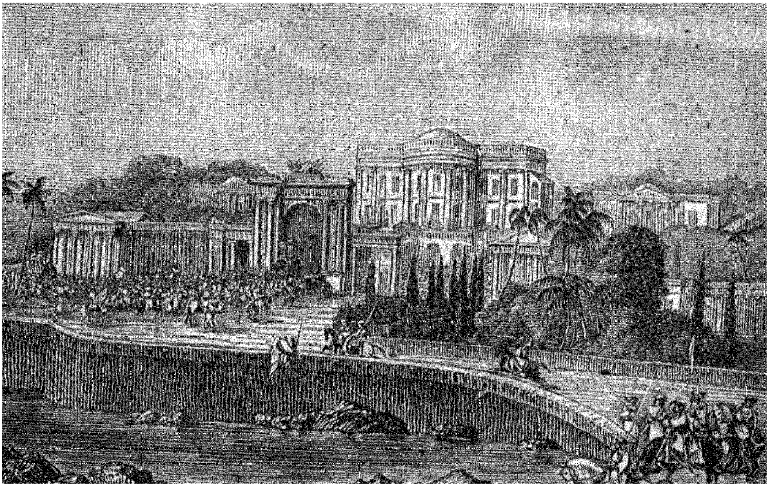


FIG. 105.—THE BRITISH RESIDENCY AT HYDERABAD

The north and west form one region based on trap rock, composed of flows of lava. The inhabitants speak Marathi and Kanarese. It is a country of wheat and cotton. The soil is fertile, and being largely clay, it retains moisture for a long time. The River Godavari and its tributary the Mānjira divide this north-western region from the other.

In the south-eastern region the people speak Telugu. The soil is sandy and it rests on granite. It is a land of tanks and rice-fields. The hills are bare, many of them being great masses of rock termed *droogs*. The rivers run dry in the hot season, and the water is stored in tanks which have been made everywhere.

The *minerals* of the State are diamonds, gold, and coal. The coal-fields are at Singareni, near Warangal in the north-east. The diamonds occur in the south-east and the gold in the south-west.

The *climate* is continental, with three seasons—cold, hot, and rainy. The mean temperature of the State is 81°. The annual rainfall is 32 inches.

His Highness the Nizam, the ruler of the State, is a Muhammadan. His family have ruled since 1713, when it began with Asaf Jah, who was the first Nizam.

The *languages* are Hindustani or Urdu (Deccani), which is the State language; Telugu, Marathi, and Kanarese. The *crops* raised are ragi, jowār, cotton, bajra, rice, wheat, oil-seeds, maize, pulses, chillies, and tobacco. The *fruits* are oranges, mangoes, and grapes. The *manufactures* include cotton and silk weaving, gold and silver lace making, silver and copper ware, swords, and pottery. The railways may be seen on the map. There are altogether about 850 miles of railway in the State.

CHIEF TOWNS.

(The population in thousands is given by the figures in brackets.)

Hyderabad (Haidarabad) (404), the capital of Hyderabad State, is situated on the Musi, a tributary of the Kistna. It is the fourth largest city in the whole of India. The Nizam's State railway connects it with Wadi on the west, and so with Bombay, 492 miles distant; and with Bezwada on the east, and so with Madras, which is 533 miles distant. Another line runs northward to Manmad on the Great Indian Peninsula line. It is a strong walled city. The Nizam has a splendid palace, and the city has many noble public buildings. The British Resident lives in the Residency, a building in a large park. Hyderabad is a nodal town, and a great centre of trade, for many wealthy bankers and merchants reside in it.

Aurungabad (36) is the second city in Hyderabad State. It is noted for its silver ware and embroidery, and for gold and silver lace. There are cotton mills and ginning factories.

Secunderabad (83) is a large British cantonment in Hyderabad, 6 miles north-east of Hyderabad city. It is one of the largest military stations in India. It has two suburbs, Chudderghaut and Trimulgherry. The rainfall is about 33 inches; the climate is healthy.

Golconda is a fort and ruined city, 5 miles west of Hyderabad. It was the capital first of the Bahmani kings of the Deccan, and then of the Kutb Shahi kings. Just outside, there are the tombs of the Kutb Shahi kings. Golconda used to be famous for the diamonds which were found in mines in the neighbourhood. There are no mines worked now.

Ajanta is a village in the north-west corner of Hyderabad. Close to it there are some ancient Buddhist cave-monasteries or *viharas*, and rock-cut temples or *chaityas* with inscriptions and highly finished paintings illustrating the habits and customs and dress and appearance of the people who lived in those days, over 2000 years ago. Visitors go to Ajanta from all parts of the world.

Assaye is a village near Aurungabad in Hyderabad State. It is famous for a great battle fought here in 1803 when Sir Arthur Wellesley defeated the Marathas.

TRAVANCORE.

Travancore State lies in the far south of India, and includes Cape Comorin, about 8° north of the equator. The Western Ghats, here known as the Cardamom Hills, run along the eastern side and divide the State from the sea. It has thus the climate of a coastal plain in the equatorial belt. The vegetation is tropical. It is the most beautiful and fertile country in Southern India. Its greatest length is 174 miles and its greatest width 75 miles. In the south it is only about 40 miles wide. Its area is 7000 square miles, of which more than half is forest and hills. The population is dense, being about 4 millions. The language spoken everywhere is Malayalam.

The Western Ghats reach their greatest height in Travancore, the highest peak being **Anaimudi**, 8837 feet above the sea. A great many mountain streams rush down to the sea, forming, with the tides, long lines of lagoons, or backwaters, which are the waterway of the country. They are connected by canals, so that boats can go 200 miles, the whole way from Trivandrum to Cochin. The longest river is the **Periyar** (142 miles). The upper waters of this river have been partly turned aside to make a great reservoir for taking water by a channel down to Madura on the eastern side of the Ghats.

There are two climatic regions in Travancore. One is made by the upper slopes and summits of the mountains, where there are evergreen forests and the air is cool. On the Ghats there are large coffee plantations and gardens of pepper, areca nuts, ginger, and spices. The other is the low coastal plain, where the air is equable, being damp and moist, and coco-nut palms grow in countless numbers amid great fields of rice. The temperature is from 70° to 90°. On the Ghats the temperature varies with the altitude, being 50° to 60° in the daytime and often at freezing-point at night. The rainfall on the coast is about 60 inches. On the Ghats it is about 200 inches.

The Nairs, or military caste, number about half a million, and there are about 700,000 Christians.

The chief industries are connected with the coco-nut, being the making of coir into ropes and mats. There are also factories for making cotton goods, tiles, and oil; and large coffee-curing works. The chief exports are copra, coir, nuts, and coco-nut oil; also ginger, pepper, areca nuts, salt fish, hides, timber, and coffee.

A railway runs through the heart of the country trom Quilon to Tinnevelly.

CHIEF TOWNS.

(The population in thousands is given by the figures in brackets.)

Trivandrum (63), the capital, is a seaport, but has no harbour. It has a fort in which there is the palace of the Maharajah.

Quilon (16), a seaport north of Trivandrum, is one of the oldest towns on the coast, and traded with Arab sailors in very early times. It is connected with Tinnevelly by railway.

The chief industries are cotton weaving, spinning, and tile-making. The exports are coffee, tea, fish, timber, pepper, and coir.

Alleppey (25) is the chief seaport in Travancore. It is about 50 miles north of Quilon. A canal connects it with Trivandrum. It has a good harbour, formed by a mud-bank in the sea, close to the coast. The chief industries are connected with the products of the coco-nut. The chief exports are nuts, oil, copra, coir, mats, cardamoms, ginger, and pepper.

MYSORE.

Mysore is a plateau in the south of the Deccan. The general slope of the country is from 3000 to about 2000 feet. The map shows that the rivers, with the exception of the Kaveri, flow northwards.

On this table-land, great massive blocks of granite, called *droogs*, and several low ranges of hills rise to a height of from 4000 to 5000 feet above sea-level.

The State measures about 230 miles from north to south, and about 290 from east to west. There are two distinct climatic regions. The **Malnād** or hill country in the west is the long slope of the Western Ghats. The **Maidān** is an eastern plain of wooded grass-land with cultivated fields, numerous villages, and populous towns. All the north of the Maidān is black cotton soil like that of the Bellary district of Madras, which adjoins it. Here cotton and millets flourish. In the south and west there are plantations of sugar-cane and rice, irrigated by channels from the Kaveri. There are also gardens of coco-nut and areca nuts. In the east there are wide tracts of red soil where *ragi* grows abundantly.

The rivers are the Kaveri in the south; and the Pennar, Palar, and the upper courses of the Tunga and Bhadra in the north. There are no lakes in Mysore, but there are about 30,000 tanks, large and small, made by building a *bund* or bank between two rising grounds.

The rainfall varies from 300 inches on the Western Ghats to

10 inches in the north and centre, where the climate is extreme. The average for the whole State is from 27 to 30 inches. In a bad season there have been great famines, when, for two or even three years, there has been scarcely any rain. The temperature is extreme in the centre and low on the Ghats, varying from about 50° to 80°.

There are very rich gold-mines in Kolar in the east of Mysore. Gold to the value of millions of rupees has been raised from the Kolar gold-mines for many years. Another gold-field has lately been opened at Anantapur in the north. Iron is mined in many places, as well as manganese.

The *industries* are the weaving of wool, cotton, and silk, the rearing of sheep and goats, the making of brass and copper pots, and carving in sandalwood. Very good carpets are made in some of the large towns.

The State is well served by railways, which run westward, north-eastward, and eastward from Bangalore as a centre, and connect it with Mysore, Madras, and Bombay. Education is very well looked after. There are colleges in Bangalore and Mysore, and schools everywhere. In this respect and in many others, Mysore is often called a model State.

Ragi is the chief food of the ryots of Mysore. Brahmans eat rice, which is also grown. Jowār is cultivated, as well as pulses and grain. Toddy is very largely made from date trees.

Bangalore (238), a very large and important town, stands on a plateau about 3000 feet above sea-level. It covers an area of 25 square miles and is divided into two parts — the Pettah or city, which is Mysore territory, and the Cantonment, which is British territory. The latter is called the Civil and Military Station. There is a large garrison of British troops. The city is the seat of government of the Mysore State. Here the Maharajah has a fine palace. The annual rainfall is 35 inches, and the climate healthy. Many European officers have settled in Bangalore. There are several colleges, and many schools and public buildings, and a good Botanical Garden known as the Lālbāgh. In the city there are woollen, cotton, and silk mills; tile and brick works, brass and copper works, oil mills and coffee-curing works, breweries and tanneries. There is a large trade in grain, cloth, silk, and oil-seeds.

Mysore (84), the capital of the old Hindu rajahs, is a large and well-built city in the centre of the State, and has many fine public buildings. It is still considered to be the State capital, and here the annual darbar is held, but the chief government offices are in Bangalore.

Seringapatam, a small town on an island in the Kaveri, once had a strong fort, and was the capital of Mysore in the time of Tipu Sultan. Here he fell, when the fort was taken by Sir A. Wellesley in 1799, and here are the tombs of Tipu and his father, Hyder Ali.

COCHIN.

Cochin is sometimes called Native Cochin to distinguish it from British Cochin which lies next to it. It covers an area of 1300 square miles and has a population of about 900,000. Small though the State is, it has, like Travancore, which it resembles in every way, two distinct regions, the hills, *i.e.* the Western Ghats, and the coastal plain at their foot. The Ghats rise in terraces up to about 5000 feet, and are covered with dense forests of teak and other timber trees. The coastal plain is watered by numerous mountain streams. It is highly cultivated and supports a dense population. Everywhere thick groves of coco-nut are seen with green rice-fields. A long line of lagoons, united by canals, connects Cochin with Travancore on the south and Malabar on the north.

On the hills, here called the Nelliampathis, there are many gardens of coffee and cardamoms. On the lower slopes grow areca nuts and jack fruits and mangoes. The *temperature* in the plains ranges from 96° to 69°, the mean being 82°. The *rainfall* is heavy, being about 120 inches in the plains and 200 on the Ghats. The chief *industries* are cotton-weaving, grass-mat making, and coir-mat making, also the extraction of coco-nut oil by steam-mills and the manufacture of tiles in factories. The *exports* are coco-nuts and their products, also areca nuts, ginger, pepper, and fish. A short line of railway connects Ernakolam with Shoranur on the Madras railway.

Ernakolam (22), the capital of Native Cochin, is situated on the British Cochin backwater, 2 miles east of the town of Cochin. It is the terminus of the railway from Shoranur. The Rajah and his officers reside here. There is a large college and many good schools. The population is equally divided between Hindus and Christians.

COORG.

This little province of British India is west of Mysore. It lies on the eastern slopes of the Western Ghats. Its greatest length is 60 miles and its greatest breadth 40 miles. The hills around are covered with coffee plantations and groves of orange trees, where the slopes have been cleared of the heavy forest that clothes the Western Ghats. In the valleys there are fields of rice. The Kaveri rises in Coorg, and its upper course is westward, winding along the bottom of the valleys There are many peaks in Coorg over 5000 feet high. In the forests there are elephants, bisons, tigers, and panthers, sambar and spotted deer, otters and wild dogs. The mountain streams are full of fish.

The Coorgs are a gallant little race of highlanders, about 40,000 in number. The total population of the province is about 164,000, but most of these are coolies who work on the coffee gardens. Coorg is the only province in India in which the "Arms Act" is not in force.

Merkara is the chief town, where the Commissioner of Coorg and his staff are stationed. The average rainfall here is 133 inches. The temperature ranges from 73° to 67°.

33. THE BENGAL PRESIDENCY.

THE Bengal Presidency, formerly known as Lower Bengal, is the most populous province in India. It includes the lower courses and the wide delta of the Ganges and the Brahmaputra, formed by the rich alluvial soil brought down, in past ages, by these great rivers from the Himalayas. The area is about 79,000 square miles, and the population (in 1921) was 46½ millions.

The Governor resides at Calcutta, and goes up to the hill-station of Darjeeling in the hot season.

There are two climatic regions. The first is the coastal plain, being the alluvial valley of the Ganges, the Brahmaputra, and their mouths and tributaries, extending along the whole coast as far eastward as Chittagong. Secondly, there is a small tract including the lower slopes of the Himalayas north of the great Delta; and a lower tract of hill country to the north of the eastern Bengal plain, including the lower slopes of the Assam Hills. The hill State of Sikkim is, geographically, a part of the Himalayan tract.

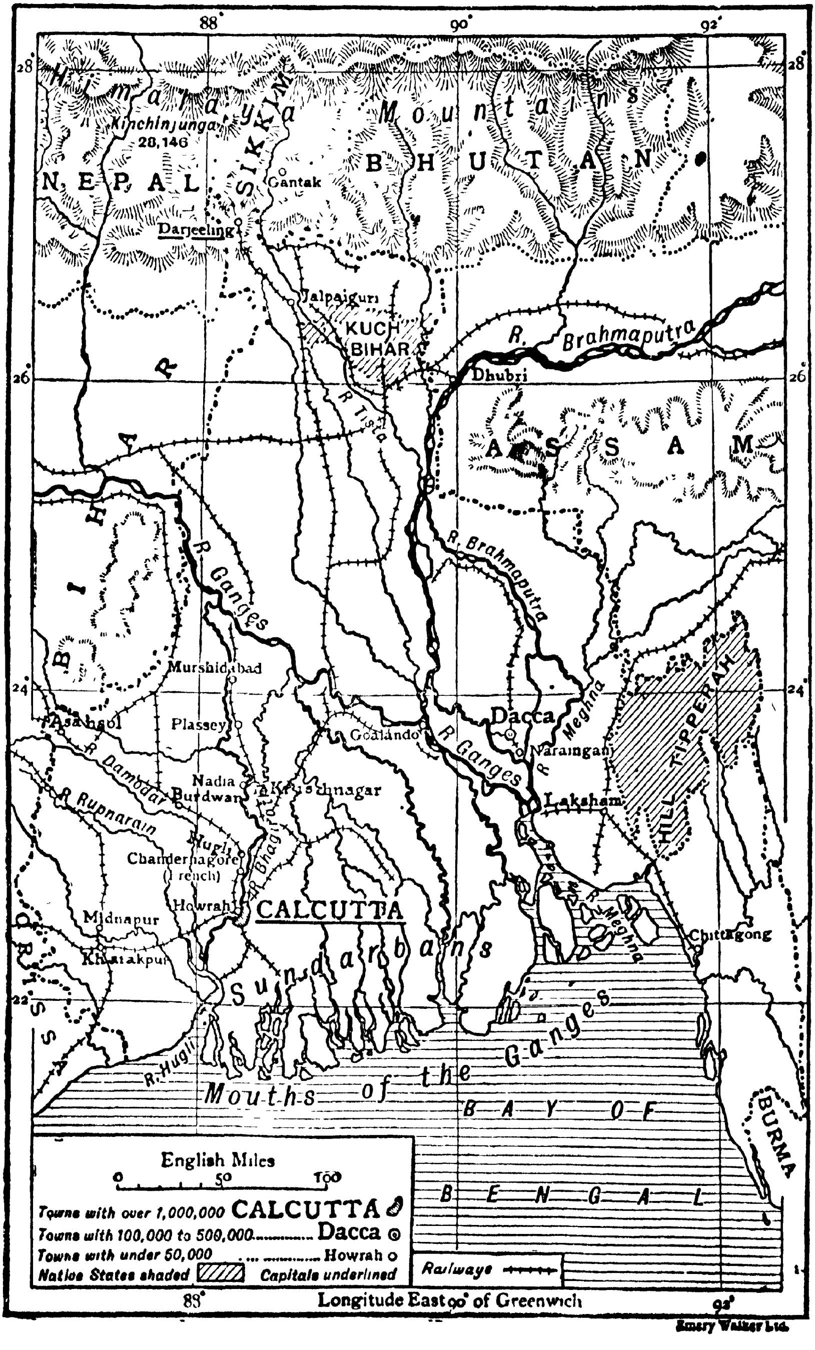
The rivers (besides the Ganges and Brahmaputra) are the Rupnarain, the Damodar, the Bhagirathi (one of the deltaic mouths of the Ganges), the Tista, and the Meghna (one of the deltaic mouths of the Brahmaputra). The Hugli (Hoogly) is the lower course of the Bhagirathi. On it Murshidabad, Plassey, Nadia, Chandernagore, Chinsurah, Hoogly, Howrah, and Calcutta are situated

The **Sundarbans** are a vast tract of swamp and forest extending for about 170 miles along the sea face of the Bay of Bengal, from the estuary of the Hugli to that of the Meghna, and running inland to a distance of from 60 to 80 miles. This tract is one wide alluvial plain, formed out of the silt continually brought down by the rivers. It is a "tangled network of streams, rivers, water courses, and islands, covered with jungle." The tree known as the *Sundri* is common. It gives its name to the Sundarbans. Towards the sea there are large groves of the mangrove.

The *rainfall* varies very much, increasing from west to east, from 70 to 140 inches. In the hill tract it is over 200 inches. There are sometimes terrible cyclones, causing great loss of life. In the district round Darjeeling earthquakes often occur.

The chief *crop* of Bengal is rice, which takes up seven-tenths of the cultivated land. Next come cereals and pulses, with a little wheat, barley, and grain. Jute is extensively grown. Bengal is by far the largest jute-growing area in the world. Oil-seeds and mustard are also cultivated. Tea is grown on a

BENGAL



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large scale in the Darjeeling district and in Chittagong. Among the *fruits* are the mango, plantain, pine-apple, jack-fruit, guava, and custard apple. The fisheries are important. One and a half per cent of the people are fishermen. The Bengalis are great fish-eaters.

Coal is the chief mining industry Four-fifths of the Indian coal comes from Bengal. The coal-fields lie within 200 miles of Calcutta, and railways have been made to them.

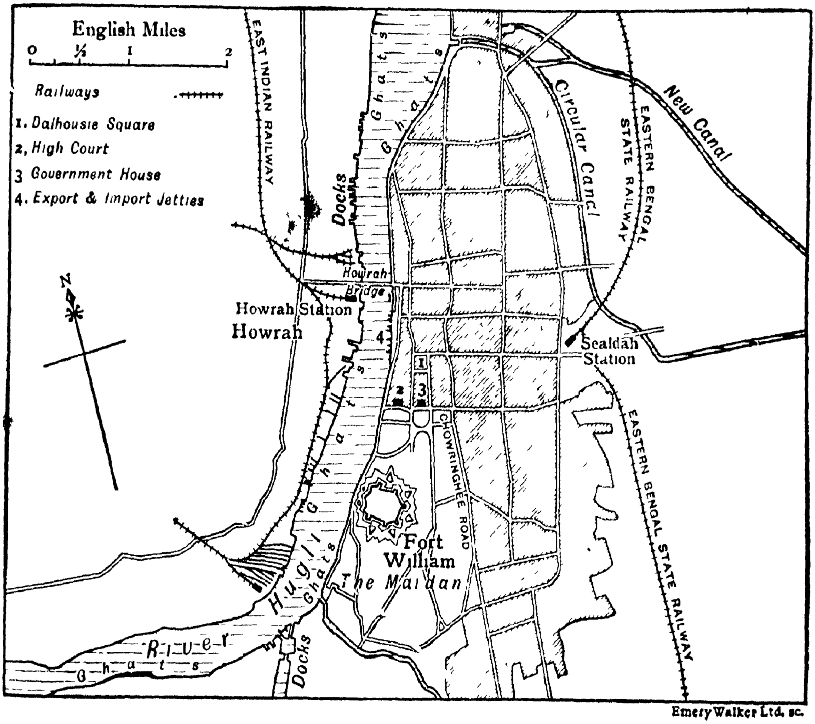


FIG. 106.—PLAN OF CALCUTTA.

CHIEF TOWNS.

(The population in thousands is given by the figures in brackets.)

Calcutta, like London, is a great port not on the sea. It is on the River Hugli, 86 miles from the sea, in 22° 34 N. and 88° 22′ E. It is only, however, about 20 feet above sea-level

It lies, for 6 miles, along the left bank of the river, and is connected by a bridge with a large suburb, **Howrah**, on the right bank. Including this suburb, it has a population of 1,263,000.

Calcutta is the "gateway," not only of Bengal, but of all Northern India lying in the valley of the Ganges All the countries in this great area send their produce to Calcutta by railways, rivers, roads, and canals, and their wants are supplied by goods, consisting of raw material and manufactured articles, which come to Calcutta by sea, and are taken to them along the same routes.

Close to the river stands Fort William, and opposite to it there is the noble park called the Maidān, 1200 acres in extent. On the north lie the shops and business houses of the great city, and Government House. To the south and east there are suburbs filled with hundreds of European residential houses. All this part of the city has good roads, well swept and watered, and well lighted at night-time. Surrounding it on all sides is the native town. Calcutta has been called the "City of Palaces." It has many splendid buildings, public and private gardens, parks and squares, a magnificent museum, and an observatory. But three-fifths of the population live in tiled huts with mud walls, the lanes between them are narrow and badly lit, and the dwellings overcrowded.

The climate is hot and moist The mean temperature is 79°, ranging from 102° in May to 48° in January. The average rainfall is 60 inches.

The East India Company fixed on Calcutta as the best place for their trade in Bengal, because it is situated at the highest point to which sea-going vessels can come up the River Hugli. They obtained it in 1690. Fort William was completed in 1702.

Over fifty different languages are spoken in Calcutta. People from all parts of the world come to it for various purposes. About 450,000 speak Bengali and 320,000 speak Hindi. By religion, 65 per cent are Hindus, 30 per cent are Muhammadans, and 4 per cent are Christians; leaving 1 per cent for all other religions combined. About a third of the inhabitants are engaged in manufactures, and about a fourth in trade. There are factories, jute mills, jute presses, oil mills, flour mills, rice mills, paper mills, iron foundries, tanneries, and printing presses. The chief exports are jute, tea, opium, hides and skins, oil-seeds, grain and pulses, indigo, lace, raw cotton, coal, raw silk, saltpetre, and oils. There has been an enormous increase of late years in the shipments of jute and coal. The jute comes from Bengal, as well as the coal, and the tea from Assam and Darjeeling.

There are two great railway stations One, at Sealdah, in the city, is the terminus of the State railways, of which one runs to the north and the other to the south. Across the river is the Howrah station, from which the East Indian Railway runs to the north and the Bengal-Nagpur Railway to the south. The University of Calcutta has a great many colleges attached to it. In the city itself there are more than a dozen; the rest are scattered all over Bengal. There is also a very large number of schools of all grades.

Howrah, the great suburb of Calcutta, stretches for 7 miles along the right bank of the Hugli. It has many industries and great trade. There are over forty factories, including cotton mills, iron foundries, and rope works. If it be regarded as a separate city, it is the largest in Bengal except Calcutta, with which it is connected by a magnificent broad iron bridge. It is the terminus of the East Indian and Bengal-Nagpur Railways. There is a large civil engineering college at Sibpur, in Howrah.

Darjeeling, the hill-station of Bengal, and the headquarters of the Government in the hot season, is situated on the southern slope of the Himalayas, at the height of about 7500 feet. It is distant 380 miles by rail from Calcutta. The scenery is magnificent. The great twin-peaks of Kinchinjunga are in full view, and many other peaks covered with perpetual snow. The mean temperature is about 42°, the annual rainfall is about 120 inches.

Murshidabad (15), on the Bhagirathi, one of the deltaic mouths of the Ganges north of Calcutta, was named after Murshid Kuli Khan, who founded it in 1704. It was the capital of the nawabs of Bengal after him. Formerly a large city with a population of 150,000, it is now merely the residence of the present titular nawab, who has a splendid palace here, and his dependents. There is still, however, some fine embroidery and carving in ivory.

Nadia (11) (also called Naba-dwīp) is an ancient town on the Bhagirathi, once the capital of Bengal under the Sena line of kings. It was the birth-place of Chaitanya, the great Hindu saint, and has many Sanskrit *Tols* or schools.

Serampore (45), on the right bank of the Hugli, not far from Calcutta, once belonged to the Danes. In the town there are several large mills. The industries are dyeing, brick-making, pottery, mat-making, and silk and cotton weaving by hand.

Plassey, on the Bhagirathi, north of Calcutta, is famous as the site of the famous battle in which Clive defeated Siraj-ud-doulah, nawab of Bengal, in 1757, and made the British masters of Bengal.

Chinsurah (30), an old town once belonging to the Dutch, was ceded to the British in 1825. It is on the Hugli River, above Calcutta. The town has been joined on to Hugli, and is now known as Hugli (Hoogly).

Chandernagore (25), a town belonging to the French, on the Hugli, a little below Chinsurah, 22 miles north of Calcutta by rail, has but little trade.

Dacca (117) is the largest and most important town in eastern Bengal. It was the capital of the short-lived province of Eastern Bengal and Assam. It is on a branch of a tributary of the Meghna about 250 miles from Calcutta. It has been a flourishing city from ancient times, and was the capital of a line of nawabs. The present nawab is regarded as the head of the Bengal Muhammadans. The muslins of Dacca were famous long before British rule. It is the most important mart of eastern Bengal. The industries, besides an enormous trade in jute, are weaving, gold and silver work, shell-carving, and boat-building. Dacca is a great educational centre with several colleges and many schools. There will shortly be a university here.

Naraingani (35), on a tributary of the Meghna, is 9 miles from Dacca, and is really the river port of that city. It extends for 3 miles along the bank of the river. It is a busy market town with great trade, for it is connected with Calcutta by steamer and rail, through Goalundo, and with Chittagong through Chandpur. There are over fifty jute factories in the town.

Chittagong (23) is a port 12 miles up a little river which flows into the Bay of Bengal It is the chief port in eastern Bengal, being the outlet for the trade of Assam and a part of eastern Bengal, the rest going to Calcutta. The chief business is the export of jute from Narainganj, which comes by rail or steamer down the river.

Goalundo is the terminus of the East Indian Railway and a mart through which enormous trade passes. It is close to the confluence of the Ganges (here called the Padma) and the Brahmaputra. There is a daily service of river-steamers to Narainganj and many other towns on these rivers.

Gantak (in Sikkim) is a small village with a population of less than 1000. It is, however, the capital of Sikkim and has the palace of the Maharajah, who resides in it.

34. BIHAR AND ORISSA.

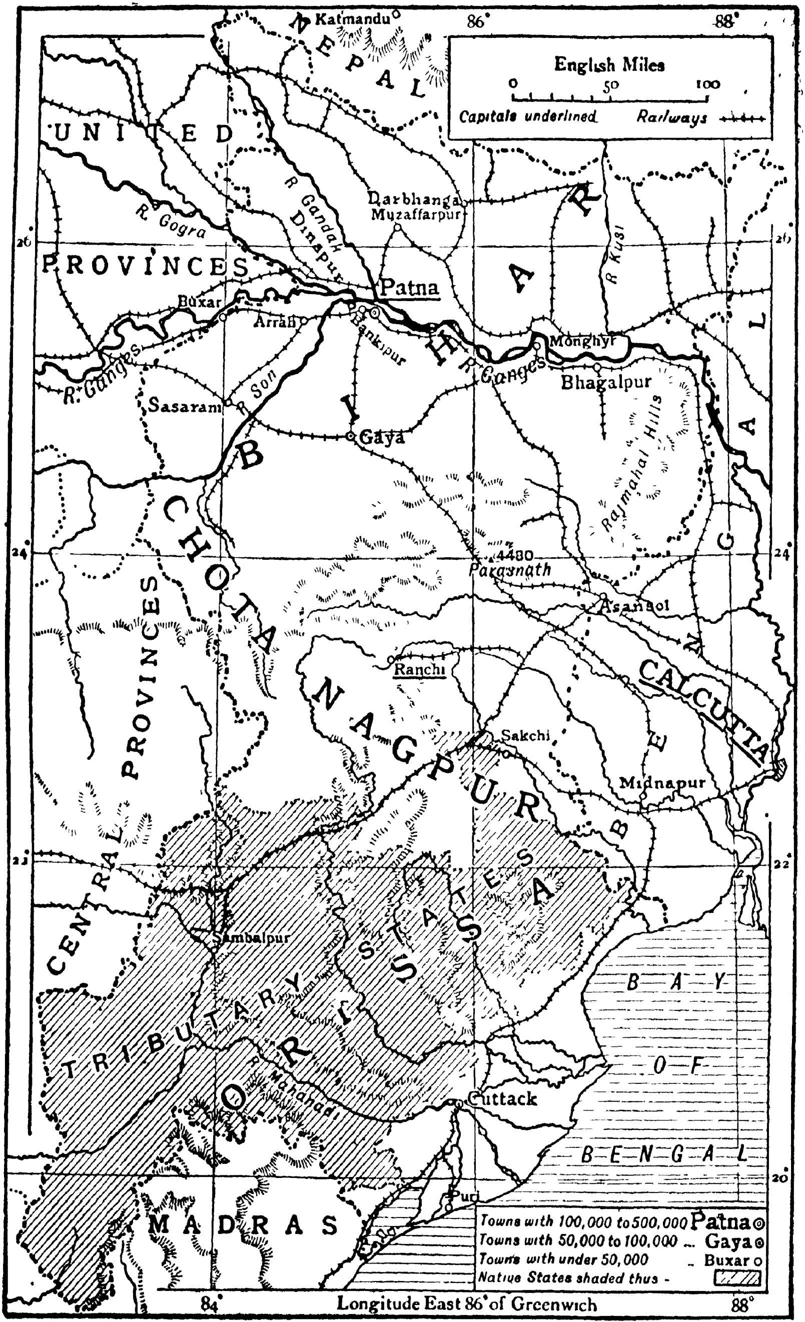
THIS province is made up of three sub-provinces, formerly included in Bengal. They are Bihar, Orissa, and Chota Nagpur. Each of these is a region different from the other two. The province was constituted in 1912. Bihar is mainly an alluvial river plain, Orissa is a coastal plain, and Chota Nagpur, which lies between Bihar and Orissa, is an upland tract of hills and plateaus. The area of the whole province is about 83,000 square miles, a little larger than Bengal, and the population is 34 million.

BIHAR.

Bihar was once the ancient kingdom of Magadha. Here Buddha lived and Buddhism was founded. The name is a corruption of *Vihāra*, a monastery; and ruins of Buddhist buildings are found in many places.

The province lies west of Bengal and is a part of the same

BIHAR & ORISSA



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alluvial plain. It is divided into North and South Bihar by the broad stream of the Ganges. It is, however, in many ways different from Bengal. Being an inland tract, the climate is more continental, so that it is colder in the winter and hotter in the summer. The rainfall is lighter, begins later, and is not so regular. The main rainfall of the S.W. monsoon is in Bengal and Assam. Only the currents of air which are turned westward by the Himalayas reach the upper part of the valley of the Ganges, including Bihar. The people are hardier and healthier, for the climate is better. The language in Bihar is Hindi. The area of the province is about 42,000 square miles, and the population 24 million.

The crops are wheat, rice, the millets and pulses, oil-seeds, indigo, and the opium-poppy.

The rivers are the Ganges and its tributaries. On the right bank there is the Son, which rises in the Satpura Hills; and on the left bank the Gogra, the Gandak, and the Kusi, which flow down from the Himalayas.

In North Bihar the rainfall is very irregular and there have been terrible famines. In South Bihar there are extensive canals which irrigate the country and famine does not often occ

CHIEF TOWNS.

(The population in thousands is given by the figures in brackets.)

Patna (120), on the Ganges near its confluence with the Son, is perhaps the most famous historic town in Northern India. Under its old name of Pataliputra, it was the capital of the ancient kingdom of Magadha 2500 years ago. Here Chandragupta and Asoka reigned. It is the chief seat of the Government opium manufacture.

Bankipur, a suburb of Patna, is the headquarters of the Lieutenant-Governor and his staff in the cold season.

Darbhanga (63), the chief town of the district, is on a railway line, and roads lead off from it in all directions. The exports are oil-seeds, ghi, and timber. In the same district there are the large estates or *raj* of the Maharajah of Darbhanga with an area of 2400 square miles.

Bhagalpur (69), on the Ganges, is a large and thriving town and very healthy.

Arrah (46), on the East Indian Railway, is famous for a brave defence of the judge's house by a dozen Europeans and fifty Sikhs, in 1857, against an overwhelming force of mutineers.

Buxar, on the Ganges and East Indian Railway, is the centre of considerable trade.

Muzaffarpur (46) is on the River Gandak, and a centre from which roads lead in all directions. The industries are the making of mustard oil, castor oil, carpets, matting, and the weaving of coarse cloth.

Monghyr (36), a large town on the Ganges, is connected by a short line with the East Indian Railway. It has an old fort, formerly important. The district is famous for the manufacture of firearms and ebony carving. Steamers go up and down the Ganges, passing the town

Gaya (68), a large town, is the centre of four lines of rail It has ancient temples. Seven miles to the south is Buddh-Gaya, where Buddha found "light" under the famous Bo tree. In the country around there are many Buddhist images and mounds.

ORISSA.

Orissa, the delta of the Mahanadi, is a coastal plain made by the alluvial soil brought down from the Deccan by the River Mahanadi. It includes also the hilly tract known as the Tributary Mahals or Tributary States. The people speak Oriya and belong to a different race from the Biharis. The area is nearly 14,000 square miles, and the population about 5 millions.

The average rainfall is 57 inches, but it is irregular and sometimes it fails altogether. Orissa suffered terribly from famine in former years, but extensive canals have been made and the risk is now much less. As the railway now runs through the province, grain is imported when there is a scarcity. The mean temperature at Cuttack is 81°. It varies from 90° to 50°.

There are seventeen Tributary States shown in one block on the map. They are ruled by their chiefs under the superintendence of a British Political Agent.

CHIEF TOWNS.

(The population in thousands is given by the figures in brackets)

Cuttack (53), a very ancient town in the delta of the Mahanadi, is the capital of Orissa, noted for its horn and ivory work. The main line for Madras to Calcutta passes through it. The industries are oil-pressing and the making of coir and carpets. There is a good printing press

Puri (50), a seaport town, is famous as the site of the great Temple of Jagannath. It is a "city of lodging-houses" for pilgrims, and has no trade and no industries. The beach is a healthy place, and many of the residents in Calcutta come to it as a "watering-place" to bathe in the sea.

Sambalpur (12), the terminus of a branch line of the Bengal-Nagpur Railway, is on the Mahanadi, and the chief town of the district. The river is here a mile wide. It is the commercial centre of the Tributary States around it The industries are the weaving of *tasar* silk and cotton cloth.

CHOTA NAGPUR.

This sub-province is a plateau dividing Bihar from Orissa. It is a hilly country, the home of numerous non-Aryan tribes, chiefly Dravidian. They speak their own dialects. The chief of them are the Santals and the Gonds. The average height of the plateau is about 2000 feet above sea-level. The area is 27,000 square miles and the total population is 5½ millions. There is only one town—Rānchi—with a population of over 20,000. The mean annual rainfall is above 50 inches. The higher parts of the plateau have a dry and pleasant climate.

Chota Nagpur is very rich in minerals, especially coal, of which large quantities are raised.

CHIEF TOWNS.

(The population in thousands is given by the figures in brackets)

Rānchi (26), on the plateau, is a healthy town, the hot-season headquarters of the Government of Bihar and Orissa. It is the chief town in Chota Nagpur.

Sākchi, on the railway not far from Rānchi, is the site of large steel works, lately opened by the Tata Company of Bombay.

NEPAL.

The kingdom of Nepal, the land of the Gurkhas, is an independent State on the northern frontier of India, extending along the southern slopes of the Himalayas for 500 miles. its greatest breadth being about 150 miles. The area is 54,000 square miles. The population is probably about 5 millions.

The State is ruled by its own Maharajah, but all power is in the hands of the Prime Minister. A British Resident lives at the capital, Katmandu, but he does not interfere in the affairs of the State.

The chief exports are cattle, hides and skins, opium and other drugs, gums, resins, and dyes; jute, wheat, rice and pulses, ghi, oil-seeds, spices, tobacco, and timber.

The country belongs to the Himalayan region. At the foot of the mountains there is the narrow belt of the Tarai, with tropical vegetation. Above it is a range of sandstone hills rising to a height of 600 to 800 feet, being a continuation of the Sewaliks. It has the climate of the Warm Temperate zone. Thirdly, there is the main range of the Himalayas which up to a height of 10,000 feet is in the Cool Temperate zone. In this zone lies the valley of Katmandu. This region is well watered, highly cultivated, and very populous. The last and highest region has the climate of the Frigid zone, being a rugged wall of rock, leading up to a chain of snow-clad peaks, of which the highest is Mount Everest (29,002 feet). Here, too, are Dhaulagiri (26,826 feet) and Kinchinjunga (28,146 feet).

The Katmandu valley is regarded as Nepal proper. It lies between the basins of the Gandak and Kusi, at a level of about 4700 feet above the sea. It is about 20 miles long and 14 wide, and is surrounded by mountains 7000 to 8000 feet high. It is well watered by the River Bāghmati.

Katmandu (50), the capital of Nepal, has an annual rainfall of 56 inches. It is on the River Bāghmati. It is a dirty and overcrowded town with many temples and pagodas. The Residency is in a beautiful park outside the city.

35. ASSAM.

THE province of Assam is the gate of India on the north-east frontier, as the North-West Province is the gate on the north-west. On the north of India lie the Himalayas, which bend round the north-eastern corner and run southwards under the name of the **Yomas** in Burmah. All along the frontier there are savage tribes of hill-men, ever on the watch to make raids into the plains, the chief of them being the Bhutias, Akas, Daflas, Abors, Mishmis, and Nagas. The British officers in Assam keep watch and ward over the frontier.

The province falls into three natural divisions or climatic regions. These are—the valley of the Surma or Barak River in the south; the valley of the Brahmaputra, or Assam proper, in the north; and between them the great block of uplands known as the Assam Hills, a plateau on which rise ranges of hills which have different names in different parts.

The total *area* of the province (including Manipur) is 61,600 square miles, and the total *population* (in 1921) was 7,500,000 The density of the population varied from 406 in the square mile in the Surma valley to 126 in the Brahmaputra valley and 34 in the hills. Only five towns in the province have a population exceeding 10,000. Assam is a land of villages. The two *languages* of the province are Assamese, spoken chiefly in the northern valley, and Bengali in the southern.

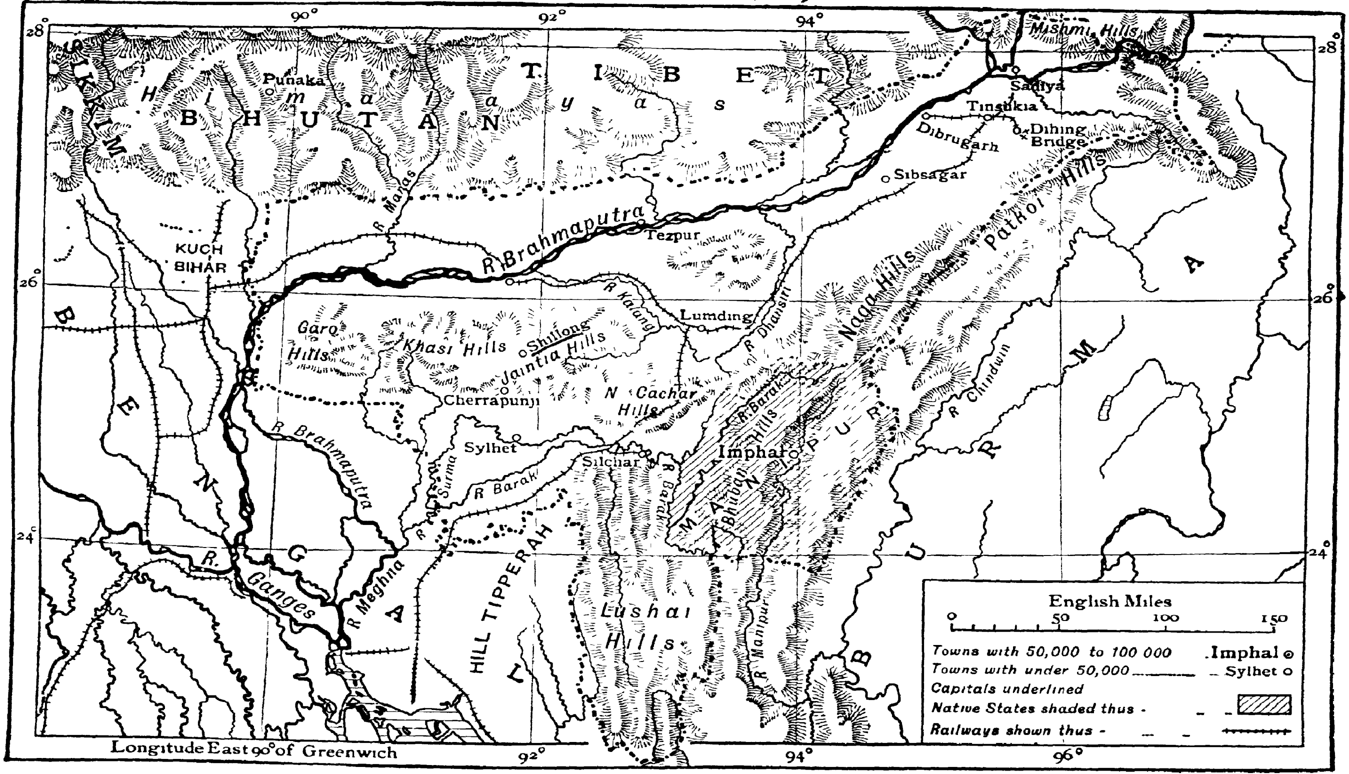
Assam proper, or the valley of the Brahmaputra, is an alluvial plain, about 450 miles in length, with an average breadth of 50 miles. It slopes down about 300 feet in 450 miles, this being the fall of the river. It lies east and west, but bends to the north-east in the upper valley, as it follows the course of the Brahmaputra. The area of this valley is about 24,500 square miles. To the north lies the main chain of the Eastern Himalayas, to the south there is the plateau known as the Assam Hills. These hills, here and there, throw out spurs which run down to the banks of the river, and at several points, *e.g.* at Gauhati, Goalpara, and Tezpur, they continue on the northern bank, the Brahmaputra having forced its way through them. The width of the valley varies at different points. At Goalpara, when the River Manas joins the Brahmaputra, the valley is very narrow and is called the "Gate of Assam," for to the east Assamese is spoken, and to the west, Bengali.

The Brahmaputra receives many tributary streams from the Himalayas on the north and from the Assam Hills on the south. On the right bank, the chief tributaries are the Dibong, the Subansiri, and the Manas, on the left, the Dihing, the Dhansiri, and the Kalang. The Dihang is the local name given by the hill-men to the southern sweep of the Brahmaputra, which is known in Tibet as the Tsang-po.

For about six miles on both banks of the river, the country is often flooded, and except at one or two points, *e.g.* Gauhati and Tezpur, there is no town or village on the banks of the river. The people live on the higher slopes of the valley There are stretches of marsh-land on both sides of the river, covered with thick grass jungle. Inland, the plain is dotted over with clumps of bamboos, palms, and fruit trees, and among them there are the houses of the inhabitants. Here the population is fairly dense.

The southern or **Surma Valley** is a flat plain about 125 miles long and 60 wide, shut in on three sides by ranges of hills, with the sea on the south. It is very different in every way from the northern or Brahmaputra valley. It is much smaller, being about 7000 square miles in extent It is much lower, the average elevation being about 22½ feet above sea-level, while that of the Brahmaputra valley at its lowest point, at Gauhati, is about 148 feet. Its rivers are sluggish, the slope of the country being very gentle, and they have very winding courses. The slope of the valley is 46 feet in 125 miles. The Brahmaputra is a swift river, and its course is comparatively straight. The banks of the Surma valley rivers, raised every year by the silt which they bring down, are higher than the country around them, and towns and villages are therefore situated on the banks of these rivers, not at a distance from them, as is the case in the other valley. To the north of the valley rise the Khasi and Jaintia Hills, 4000 feet in height.

ASSAM



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The Surma, which gives its name to the southern valley, flows from east to west. It rises in the Naga Hills, where it is known as the Barak. It flows southward through Manipur, through a valley between the Bhuban Hills and the N. Cachar Hills. Then it turns northward and then westward through the Cachar district. Near Silchar it divides into two branches, the northern being called the Surma and the southern being known first as the Kusiyara and then as the Barak. The two branches unite and join the Brahmaputra, which below this point is called the Meghna.

In the plain there are groups of low hills in different parts. Away from these hills, the whole valley is subject to floods which often cause widespread damage. Most of the valley is a network of sluggish streams, including the numerous tributaries of the Surma.

The Assam Hills.—The third division of the province is the hilly tract in the centre, dividing the upper valley from the lower. This great upland region runs from west to east. The whole block is known as the Assam Hills, but different names are given to different parts, according to the tribes which inhabit them. These are, in order from west to east, the Garo, Khasi, Jaintia, and N. Cachar Hills. Farthest east are the Naga Hills. The Barail range is a spur which runs southwards from the south-east margin of the Khasi-Jaintia plateau.

At right angles to the Assam Hills, at the eastern end of the Khasi-Jaintia plateau, another great block of highlands runs north and south. It divides Assam from Burmah, and is a continuation of the eastern bend of the Himalayas. In the north it is known as the Patkoi Hills. These hills are connected by the Naga Hills with the Bhuban Hills, which run southwards through Manipur. Below them are the Lushai Hills, which run down close to the Bay of Bengal, and are inhabited by the hill tribe called Lushais.

The Garo-Khasi tract of the central plateau reaches its highest point in the peak above Shillong at 6450 feet. On their southern face the hills fall steeply to the plains. Towards the Jaintia and N. Cachar Hills on the east, the level falls, but the Barail range has peaks from 5000 to 6000 feet in height.

The Naga Hills rise still higher, where they divide Assam from Manipur. Here the peak Japvo, the highest hill in Assam, reaches 10,000 feet. The Patkoi Hills have peaks of 8000 and 9000 feet. Snow often falls on these hills.

The *climate* of Assam is damp, owing to the moisture of the in-blowing winds from the Bay of Bengal. In the cool season dense fogs rise from the rivers. The mean temperature in the Brahmaputra valley is about 75°. Sibsagar is the most cloudy station in India.

The chief *crops* are tea, which is cultivated in both valleys, and rice. Assam is one of the chief tea-growing regions of the world. There are 355,000 acres of land under tea. Other crops are mustard, sugar-cane, and pulse.

Silk is produced in large quantities in both valleys. Nearly every house has its patch of castor oil plant on which the silk-worm feeds. *Cotton* is grown on the slopes of the hills. *Lac* and *rubber* are obtained from the forests on the hills. *Mustard* is very largely cultivated in the northern valley. *Jute* is grown for home use, chiefly in the southern valley. *Oranges* flourish on the Khasi Hills in Sylhet, and are largely exported to Bengal.

The most important *minerals* found in Assam are coal and limestone. The coal is of good quality and is used on the river steamers and in the tea-gardens. A good deal is also exported to Bengal. *Petroleum* is being raised in increasing quantities from wells in Upper Assam There are vast stores of *limestone* on the southern face of the Khasi and Jaintia Hills. The lime is exported to Bengal.

CHIEF TOWNS.

(The population in thousands is given by the figures in brackets)

Cherrapunji is a village in the Khasi Hills, on a small plateau overlooking the plains of Sylhet, 4455 feet high. It has the highest recorded rainfall in the world. The average rainfall is 458 inches, but in the year 1861 there was a fall of 905 inches, of which 366 were registered in the month of July. At this point the Khasi Hills rise straight up from the plains, and the south-west monsoon blows right against this great barrier of rock. The clouds, saturated with moisture, are carried upwards, condense in the cold air over the summit of the hills, and the water falls in torrents of rain.

Dibrugarh (11), on the River Dibru, a tributary of the Brahmaputra, is the terminus for river steamers from Calcutta and for the railway which joins the Assam-Bengal line at Tinsukia. The rainfall is 112 inches. This cool and pleasant station is the commercial centre of the district. It imports grain, oil, salt, piece-goods, and other stores to supply the wants of the tea-gardens around it.

Gauhati (12), the old capital of the ancient kingdom of Kamrup, lies on both banks of the Brahmaputra It is the terminus of the Assam-Bengal railway. There is a good metalled road up the Ghat to Shillong, and on it motor-cars run daily between the two stations. The steam-ferry crosses the river here, nearly a mile wide, to meet the Eastern Bengal State railway on the other bank to Calcutta. Gauhati is the principal centre of trade in Lower Assam. The exports to Calcutta are cotton, silk, mustard, lac, and forest produce. There are steam mills for cotton-spinning, flour-grinding, and mustard-oil making The average rainfall is 67 inches.

Shillong (8), the summer capital of the administration of Assam, is connected with Gauhati by a metalled road, 63 miles in length. The climate is mild and equable The average annual rainfall is 85 inches. The temperature ranges from 82° to 34°, the mean being 62°. The height of the station above sea-level is 4792 feet. It is situated on a table-land about midway between the valley of Assam and the plain of Sylhet. It is about 30 miles north of Cherrapunji. The Shillong range, immediately to the north, rises 1000 feet higher than the station. The whole region is much subject to earthquakes; the houses are therefore not built of stone but of wood

Sylhet (14) is the chief town in the most populous district of Assam. It is a very damp place with an average rainfall of 157 inches, but the climate is cool and fairly healthy. The industries are the making of umbrellas, mats, and shell ornaments.

Imphal (75) (in Manipur), the capital of Manipur State, is a large town 2000 feet above sea-level, situated where three rivers meet. The rainfall is moderate, being 70 inches, and the climate is cool and pleasant. The inhabitants are nearly all agriculturists.

Sadiya, on the Brahmaputra, is an important station of British India on the north-east frontier. The railway from Gauhati, in the far north-east of Assam, comes up to the opposite bank of the river. Sadiya stands on a high grassy plain, from which there is a fine view over the surrounding hills. From it, chains of outposts run to the north and east. It is the duty of the British officer stationed here to keep constant watch on the Abors and other savage hill tribes beyond the frontier. There have been frequent petty wars with them. There is a large bazaar in the place, in which the hill-men exchange rubber, wax, ivory, and other jungle produce for cloth, salt, metal pots, and opium.

Sibsagar (6) is a town on the Dikho, a tributary of the Brahmaputra, from which it is 9 miles distant. The rainfall is heavy, being about 94 inches, but the climate is healthy

Silchar (9), on the Barak River, is the headquarters of the Cachar district. The rainfall is heavy, being 124 inches. It is the industrial and educational centre of the district. There is a good deal of trade in rice, piece-goods, and timber. The chief crops of the district around it are tea and rice. There are about 150 tea-gardens, with over 50,000 coolies.

MANIPUR STATE.

This tributary State, in the east of Assam, is an upland about 2500 feet above sea-level, with a valley in the centre about 30 miles long and 20 wide, encircled by hills. The Naga Hills lie on the north and the Lushai Hills on the south. In the north-east peaks rise to the height of 13,000 feet. The country is well watered by several streams, the chief of them being the Barak and Manipur rivers. The soil of the valley is alluvial clay, washed down by the rivers, and is fertile, rice being cultivated largely. The hills are covered with forest and wild animals abound. The crops, other than rice, are mustard, sugar-cane, pulses, and tobacco. The fruits are oranges, limes, pine-apples, plantains, jack-fruit, and mangoes. The Manipuri ponies are well known. The industries are the making of brass and other metal pots and leather work, and the weaving of cotton and silk cloth. Manipur is ruled by its rajah. There is a political agent stationed in Imphal. The population of the State is 346,000.

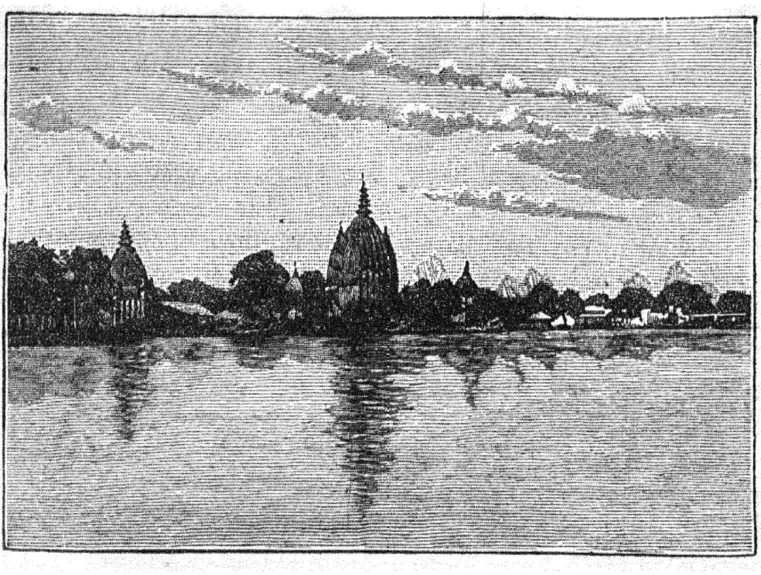


FIG. 107.—SIBSAGAR.

BHUTAN.

Bhutan is an independent State in the Eastern Himalayas, lying between Tibet and Assam. It is a wholly hill country, filled with steep ridges and deep valleys between them. There are many peaks over 20,000 feet in height. The mountains are covered with dense forest, in which are numerous wild animals —elephants, leopards, bears, rhinoceros, and deer of every kind. The climate varies from a pleasant warmth at the foot of the hills, to the freezing cold of the Arctic regions on their summits. The people, called Bhutias, are a hardy race of dark Mongolians. The chief crop is maize, which grows up to 7000 feet. There is also a little wheat.

The area of the province, which is 190 miles in length by about 80 miles in breadth, is about 20,000 square miles. The whole population is estimated at about 250,000. The Maharajah makes the little town of **Punaka** his winter capital. It is 96 miles north-east of Darjeeling. The chief productions of the State are maize, jungle produce such as lac and wax, ponies, and silk.

36. THE UNITED PROVINCES.

This, the central province of Northern India, is so called because it includes two provinces—Agra and Oudh. It lies in the Warm Temperate zone, just outside the Tropics. Its greatest length is 500 miles, its greatest breadth about 300 miles. Its extent, including the native States of Rampur, Benares, and Tehri-Garhwal, is a little over 112,000 square miles, the population of this tract being 45,500,000.

The country is mainly a very old alluvial plain, formed, in the far past, by the silt brought down by the Ganges and its tributaries. At a long distance from the river the plain slopes gradually upwards; to the Himalayas on the north, and the Vindhya Mountains on the south. There are four different regions, (1) the Himalayas, (2) their southern slopes, (3) the Ganges valley, and (4) the hilly country in the south.

The Himalayan tract on the north includes the districts of Almora, Dehra Dun, Naini Tal, and the native State Tehri. The outer ranges of the great mountains rise quickly to a height of 7000 or 8000 feet, and here there are the hill-stations of **Naini Tal** and **Mussoorie.** The climate is delightful, being that of the Cool Temperate zone. Above this range a second range rises to an elevation of 11,000 feet. Beyond this tower the huge peaks of Nanda Devi (25,660 feet) and Nanda Kot. Here there is perpetual snow, and the climate and vegetation are like that of the Frigid zone. In the mountains there are the sources of the Ganges and Jumna.

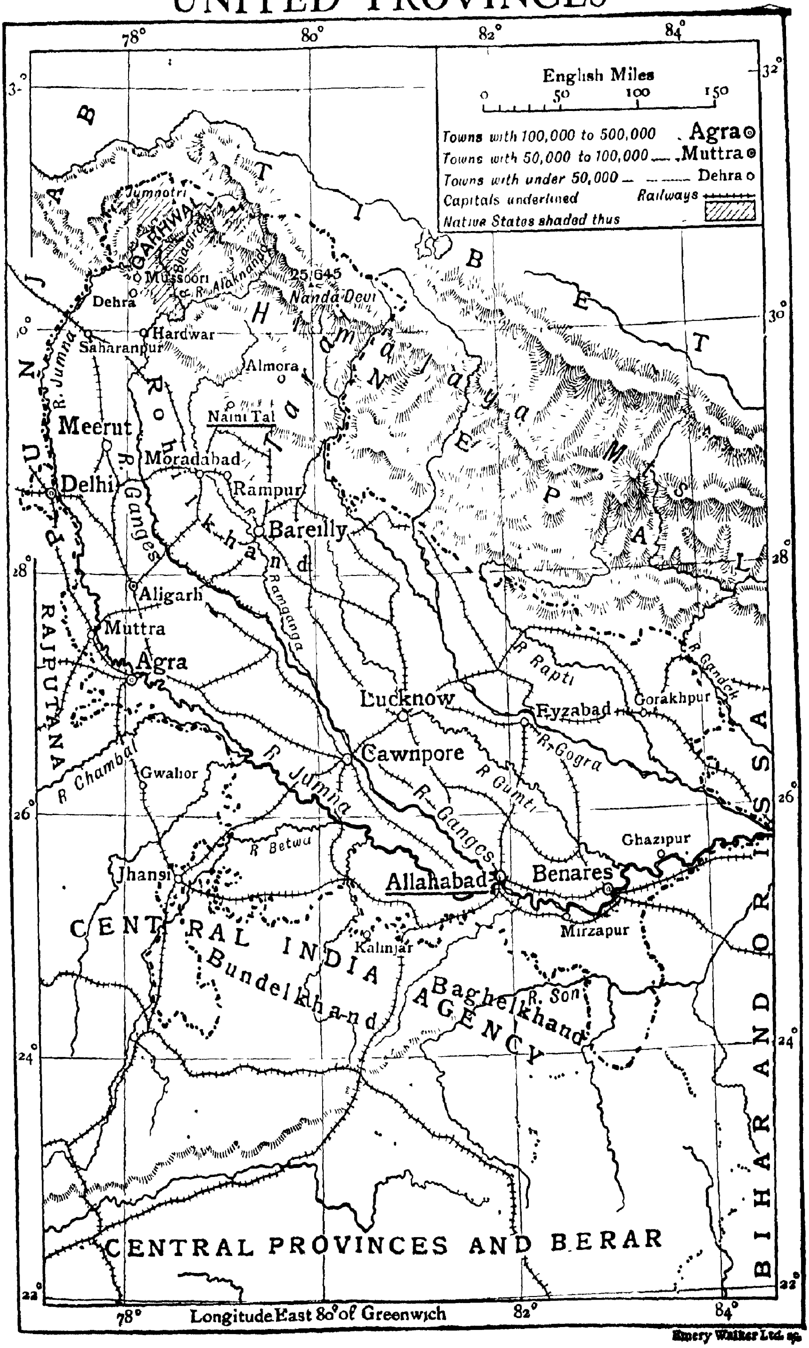
Along the base of the hills lies the second region, a wide strip of hot, marshy land called the Tarai, filled with thick jungle and long grass, the home of tigers and elephants. The climate is tropical and deadly. Below this tract the country slopes down to the plains.

The third region is the alluvial fertile plain or old valley of the Ganges, which includes rather more than half of the province, over 50,000 square miles. The space between the Ganges and its great tributary, the Jumna, is known as the Doāb. The country is watered, not only by rivers but by a great system of canals.

The fourth region has an area of about 10,000 square miles, and consists of the eastern slopes of the Central India plateau, known as British Bundelkhand. It is made up of low rocky hills, spurs of the Vindhya Mountains, covered with stunted trees and low jungle. The soil is poor and the rainfall scanty. This is the most backward portion of the province.

The upper and part of the middle course of the Ganges are through the United Provinces. Before roads and railways were made the Ganges was the great water-way of the country, and heavy goods, such as rice, metals, stone, grain, and sugar, still come down or go up the river in large boats, and timber and bamboos are floated down the upper part of its course. The climate is continental. There are three seasons in the year. The winter or cold season is from November to March. The temperature in January is 47° or 48°. The sky is clear and there is sometimes frost, but the days are pleasantly warm. The rainfall is then about 2 inches. From March to May the increasing heat causes a hot land-wind with violent dust-storms. The temperature in May is over 100°, and often runs up to 107°. In June the S.W. monsoon begins, and lasts till October. There is much cloud and fog. The monsoon comes both from the Bombay current of air, *i.e.* from the Western Ghats, and from the Bengal current, caused by the Himalayas turning the direction of the

UNITED PROVINCES



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winds to the west, up the Ganges valley. The rainfall is heaviest in the east, where it is over 50 inches. In the west it is only about 27½ inches. This is in the Ganges valley. In the mountain tracts the rainfall is much heavier, *e.g.* at Naini Tal it is 102 inches, and at Mussoorie 97 inches.

Three *languages* are spoken in the plains: Western Hindi by about 21½ millions, Eastern Hindi by about 15 millions, and Bihari Hindi by about 10 millions. The official language is that of the Muhammadans, namely Urdu.

The *food-grains* are rice, wheat, gram, barley, *jowār*, *bājra*, and maize. Other crops are oil-seeds, castor oil, linseed, and *til*. Cotton is largely grown, also hemp, the opium-poppy, sugar-cane, and indigo The *fruits* are the mango, loquat, tamarind, custard-apple, guava, plantain, pine-apple, shaddock, fig, melon, orange, and lime. There are tea-gardens in the Dehra Dun.

The *industries* are cotton weaving and spinning, silk-weaving, embroidery in gold and silver, rug, blanket, and carpet making, dyeing, tanning, sugar-making, and stone-carving. The province is well served by railways, which may be seen on the map.

CHIEF TOWNS.

(The population in thousands is given by the figures in brackets)

Agra (185½), on the Jumna, the fourth city in the province, was the capital of the Mughal Empire in the time of Akbar and Shah Jehan. It has many splendid buildings—the Taj Mahal, the most beautiful tomb in the world, the Pearl Mosque, and many more Agra is a beautiful city with many public buildings, colleges, schools, and hospitals. It is one of the most important centres of the arts and manufactures in the province, and famous for marble articles beautifully inlaid with precious stones.

Aligarh (65), north of Agra, has large trade and manufactures. It has the most important Muhammadan college in India, founded by Sir Saiyid Ahmad. Students come to it from all parts of India and Asia

Allahabad (156), on the confluence of the Jumna and Ganges, is the capital of the province and the seat of the Lieut.-Governor. The Hindu name for the city, which is one of the most ancient towns in India, is Prayag. It is quite 3000 years old. It has a fine park and many public buildings.

Almora (9), a hill-station in the Himalayas, north of Naini Tal, is in the Kumaon district, and formerly belonged to Nepal. It is built on a ridge 5200 feet high.

Bareilly (128), on the Ramganga, is the largest town in Rohilkhand. The chief industry is sugar-refining.

Benares (200), or Kāsi, on the Ganges, is to the Hindu the holiest place in the world. It is full of temples, and thousands of pilgrims come to it from all parts of India. It has two fine colleges, many schools, and is a centre of Sanskrit learning. The chief manufactures are brass ware, silk, jewellery, and embroidery.

Cawnpore (213), on the Ganges, is the most important manufacturing and commercial town in the province. There are many mills for spinning, weaving, and pressing cotton, and factories for tanning and making boots, shoes, saddles, and other leather articles. There are also woollen mills, jute mills, tent-making factories, sugar mills, flour mills, iron foundries, and chemical works.

Dehra (28), 2300 feet high, is the terminus of a short railway, and has a very good forest school. The town is in the *dun* or highland valley of the same name, between the Sewaliks and Himalayas. The scenery is lovely and the air bracing.

Ghāzipur (40), a large town on the Ganges, east of Benares, has an enormous factory for the making of opium. Another industry is the making of scents, chiefly the *Otto* (*atr*) of roses.

Hardwar (26) is an ancient town sacred to Hindus. It is on the Ganges, not far from the confluence of the Bhagirathi and Alaknanda, and is visited by many pilgrims.

Jhānsi (70), in Bundelkhand, is a large nodal town on the railways which meet here in the south-west of the province. It is nearly midway between Bombay and Calcutta, being 700 miles from the former and 800 from the latter town. It lies at the foot of a strong fort on a hill and has a large military garrison. It is the chief trade centre of the district. There are large railway workshops.

Lucknow (244), the capital of Oudh, is the largest city in the province, and the fourth largest in India. It is on the River Gumti and is a nodal town. It has a beautiful park and many splendid buildings. The cantonment for troops is the largest in the province. There are important manufactures of silk and cotton, jewellery, carving in wood and ivory, and potteries. There are also factories, railway workshops, printing presses, and mills.

Meerut (124), in the doāb between the Jumna and Ganges, is 40 miles north-east of Delhi. It is the chief military station in the province.

Mirzapur (32), in the south-east of the province, is on the Ganges between Allahabad and Benares. It is the centre of the largest brass-making industries in the provinces. It is famous for its woollen carpets. There are also 80 factories for the making of shell-lac from stick-lac found in the jungles to the south.

Moradabad (83), on the Ramganga, is a very large city and nodal town, as the map shows, in the centre of Rohilkhand in the north-west of the province. The chief manufacture is brass-ware, highly ornamented and coloured. It is known as Moradabad ware.

Mussoorie (15) is a hill-station in the north of the Dehra Dun, 7000 feet above the sea. It has a suburb called Landour, a depot for soldiers who have been ill. It is the most favourite sanatorium in Northern India. It is a great educational centre for Anglo-Indian children, having over a dozen good schools specially for them.

Muttra (58), on the Jumna, between Delhi and Agra, is held sacred by Hindus as the birthplace of Krishna. It was an ancient city, filled with temples, 2000 years ago. There are lines of ghats on the river banks, thronged by bathers. There are many industries, chiefly the making of paper and brass images.

Naini Tāl is a beautiful hill-station, built around a small lake, 6400 feet above sea-level, and surrounded by hills. It is the summer headquarters of the government of the province, and has handsome public buildings. There are several good schools for Anglo-Indian boys.

Roorkee (17), on the railway, near Hardwar, has the chief engineering college in India.

Fyzabad (55) is a large nodal town (see Map) on the Gogra, north of Allahabad. It is a fine city, with a beautiful park. One of its suburbs is the ancient city of *Ayodhya*, once the most splendid city in Northern India, the capital of Rama.

NATIVE STATES UNDER THE GOVERNMENT OF THE UNITED PROVINCES.

Tehri, or Tehri-Garhwāl, is a small native State, 4200 square miles in size, in the Himalayas. It contains the source of the Ganges, *Gangotri*, and that of the Jumna, *Jumnotri*. It is a mass of lofty mountains covered with dense forests. The Rajah rules over about 270,000 subjects, and resides in Tehri, a large village in the centre of the country. There are no towns.

Rampur is a little native State with an area of about 800 square miles in Rohilkhand. It is a level, fertile tract of country, watered by the Ramganga. It is famous for a fine breed of large greyhounds and for beautiful soft shawls, known as Rampur chaddars. The population is about half a million, of whom about half are Muhammadans. The crops are maize, rice, and wheat. The chief industry is the weaving of fine cotton damask cloth. Beautiful coloured pottery is also made, and sword-blades and cutlery. A line of railway runs through the State.

Rampur (73), the capital, is the residence of the Nawab. It has a very good Oriental library, with many rare manuscripts, and is the chief trading centre of the State.

Benares. The estates of the old ruling family of Benares, about 1000 square miles in extent, were in 1911 made into a native State under the Maharajah of Benares as ruling chief. The city of Benares is not included in the State.

37. THE PUNJAB.

THE name Punjāb comes from two Persian words, *Panj*, five, and *Āb*, water or river. This name describes the country. It is the Land of the Five Rivers, *i.e.* the Indus with its tributaries the Jhelum, the Chenab, the Ravi, and the Sutlej with its tributary the Beas. Two other tracts of land are now included in the province, viz. the country to the east of the Sutlej, up to the river Jumna, which is the eastern boundary of the Punjab; and the country to the west of the lower Indus up to the Suleiman Mountains, which form the south-western boundary.

The province, without its native States, has an area of about 100,000 square miles, with a population (in 1921) of about 20½ millions. It slopes down from north-east to south-west, as the course of the River Indus shows, and its greatest length in this direction is about 500 miles. Its breadth in the opposite direction, *across* the rivers from the north-western corner at Attock, to the south-eastern corner at Delhi, is about 560 miles. Near the foot of the Himalayas, at Sialkot, the height of the plain above the level of the sea is 850 feet, while at Multan in the south-west, it is 400 feet. The slope of the Punjab proper, between these two points, is therefore about $1\frac{4}{5}$ or very nearly 2 feet in a mile, although to the eye the plain looks quite flat.

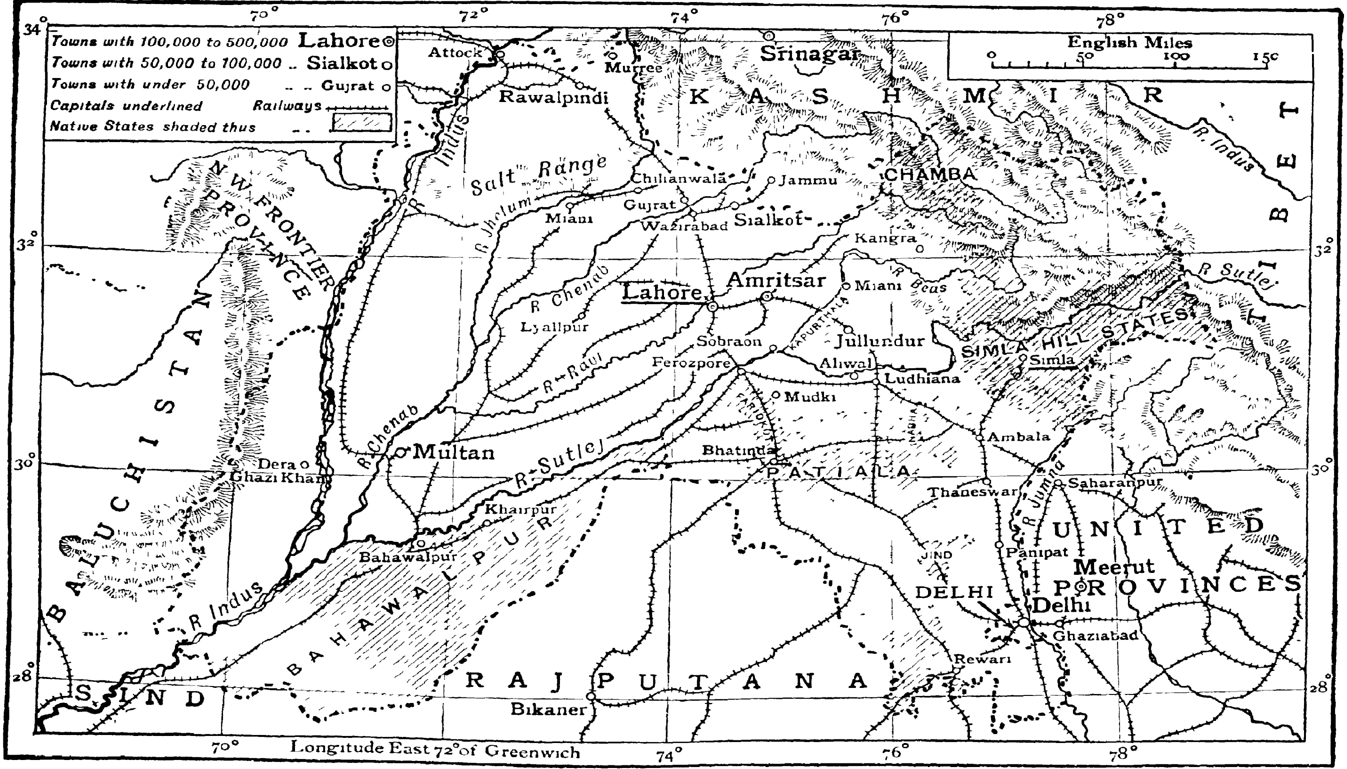
The Himalayas are the northern boundary of the province. In the north-west a short range of hills known as the Salt Range stretches across from the Indus to the Jhelum, cutting off the north-western corner below Attock. This corner is a table-land about 2000 feet high. On its slopes there are beds of solid salt, the largest known masses of rock sàlt in the world. Another ridge of hills, called the Sewaliks, is an outer range of the Himalayas along the north-east of the Punjab.

These mountain ranges and the rivers divide the Punjab, roughly, into five climatic regions. They are:

1. The Himalayan region, *i.e.* the upper slopes and summits of the mountains.

2. The Himalayan sub-montane, *i.e.* the lower slopes and country near the base.

PUNJAB AND DELHI



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3. The plateau north of the Salt Range.
4 The eastern plains, *i.e.* the plains east of the Indus.
5. The western plains, *i.e.* the plains west of the Indus.

The *Himalayan region* includes the snow peaks and glaciers of the Upper Himalayas. It has the climate and vegetation of the Frigid zone. It includes an area of over 20,000 square miles, inhabited by a few hill tribesmen who live in scattered hamlets.

The *sub-montane tract*, including the Sewaliks, is a long narrow strip of country on the lower slopes of the mountains. It has a good rainfall, is well watered by streams from the hills, and is a fertile and thickly populated country. Its population of over 4 million is made up of tillers of the soil and shepherds. It has one large town, Sialkot.

The *plateau north of the Salt Range* is a tract of broken country with but little rain (except on the hills), no rivers, and no canals.

The *eastern* and *western plains* are both in what may be termed the Punjab proper, the land of the five rivers, the great alluvial plain formed by the silt brought down by the Indus and its tributaries from the Himalayas. But even here there is a difference. The western plains lie in the lee of the Suleiman Mountains which shut out the winds from the west. They are dry, hot, and nearly rainless. The eastern plains get some of the monsoon rains which blow up the valley of the Ganges from the east along the sides of the Himalayas.

The *rainfall* in the province is heaviest on the Himalayas, where it often reaches 100 inches. It decreases rapidly to the south. The sub-montane tract and the plateau of the Salt Range have a rainfall of 30 to 40 inches. The eastern plains have a rainfall of about 24 inches, the valley of the Jumna having more than the country to the west. The western and south-western plains are extremely hot and very dry, and get scarcely any rain.

The *languages* spoken are Western Punjabi, Eastern Punjabi, up to Sirhind; and (east of this) Western Hindi. In the north-west Pashtu is the language of the Pathans, and Persian that of the Persians, Baluchi is spoken west of the Indus and in

Bahawalpur. The hill tribes speak dialects of Pahari. About 50 per cent of the population are Muhammadan, chiefly in the west and north-west. Hindus are more numerous in the east.

The *chief crops* are wheat, grain, and barley. The canals have increased the cultivation of wheat enormously. Maize, jowār, bājra, and rice are also grown. Cotton is now grown for export. Oil-seeds and sugar-cane are cultivated in some places, and tobacco. There are tea-gardens in the Kangra valley on the slopes of the Himalaya.

The *climate* of the Punjab is, on the whole, extreme or continental, having very hot summers and very cold winters. But it varies in the five regions mentioned, in the plains, the lower slopes and the higher slopes of the hills, and the position east and west of the Indus.

The extremes are greater than anywhere else in India. In January and February the temperature falls below freezing-point at night but in the daytime rises to 75°. For four months in the year, in the cold season, the climate is very pleasant. There is bright sunshine and the air is keen and bracing. In summer the heat is very great. The thermometer stands at 115° to 120° in the daytime, and does not fall below 80° to 83° at night. The heat, however, is dry heat, not the steamy moist heat of Bengal.

The *densest population* is in the eastern plain where it rises to 314 persons in a square mile. In the districts of Jullunder and Amritsar it is 641 and 639. The sub-Himalayan tracts are also thickly peopled, with 300 to a square mile. But in the dry western plains there are only 96, and in the Himalayan tract only 77 persons to the square mile. Two cities, Lahore and Amritsar, had (in 1921) over 100,000 inhabitants, 53 towns had over 10,000, and 99 more than 5000.

The *chief industries* of the Punjab are cotton-spinning in nearly every village; the making of rugs and blankets, shawls, silk cloth, carpet-weaving, jewellery, rough pottery, wood-carving, ivory-carving, and paper-making.

The province is well provided with railways, as the map shows.

CHIEF TOWNS.

(The population in thousands is given by the figures in brackets.)

Aliwal village is famous in history for the battle fought in 1846 between the Sikhs and the British under Sir H Smith.

Ambāla (76), has one of the largest military cantonments in India. It is an important railway junction. The line from Delhi to Simla goes through Ambāla. It has a large grain and corn market and many mills and factories Excellent cotton carpets are made.

Amritsar (160) is a very large and important town 33 miles east of Lahore. It is the centre of the Sikh religion, for it has their Darbar Sahib or *Golden Temple*, and their sacred book, the Granth Sahib, and the great Khalsa College for Sikhs. It is a very important centre of trade and commerce. The carpets and shawls made in Amritsar are known all over the world. There are many steam factories and mills.

Attock, in the far north of the Punjab, has a strong fort which commands the passage of the Indus. There is a striking gorge through which the Indus flows just above the fort, where it is joined by the Kabul River. The fort is famous in history.

Chilianwala is a village near Sialkot, famous as the scene of a battle between the Sikhs and the British under Lord Gough in 1849.

Dera Ghazi Khan (24) is in Multan division, west of the Indus The town is on the banks of the Indus, which has often nearly washed it away. It is in one of the hottest regions of India. There is scarcely any rain. The population is mainly Muhammadan.

Ferozpur (51), on the Sutlej, is an important railway junction. It is a military cantonment, and a thriving centre of trade.

Gujrat (20), an ancient town on the North-Western Railway, is in a fertile tract in the sub-montane region, between the Chenab and the Jhelum. It was the scene of the final battle between the Sikhs and the British under Lord Gough in 1849. It is the trading centre of the district around it.

Jullundur (69) (**Jālandhar**), on the main line between

Lahore and Delhi, is a large and flourishing town. It was an important town 1000 years ago. It is now a military cantonment.

Kângra is a small town in the Sewalik Hills in the beautiful Kangra valley, now a centre of tea cultivation. The rainfall is fair, being about 70 inches, and the temperature ranges from 53° to 80°. In it was the famous Nagarkot temple, plundered by Mahmud of Ghazni in 1009. It has a famous old fort with inscriptions 2000 years old.

Lahore (280), the capital of the Punjab, on the River Ravi, is a great nodal town, where railways meet from Calcutta, 1252 miles distant, Bombay 1280, and Delhi, 298. It is the second largest city in the province and by far the most important. There are twice as many Muhammadans as Hindus in Lahore. There are several large colleges, many schools, a magnificent museum, hospitals, and many handsome public buildings. It was founded more than 2000 years ago, and has always been famous in history. There is a strong fort, once a stronghold of the Mughals. At Shahdara, 4 miles away, there are the splendid tombs of Jehangir, Nur Jehan, and her brother Asaf Khan. There are many other splendid buildings and mosques

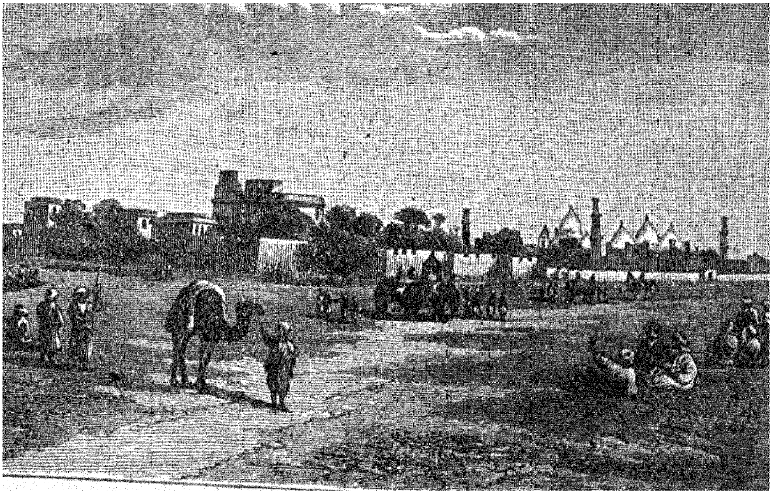


FIG. 108 —WALLS OF LAHORE CITY.

and tombs erected by the Mughal emperors. There is a large military cantonment 3 miles off, long known as Mian Mir. The native city is a walled town with very narrow streets, where two carriages cannot pass It is crowded with shops and bazaars.

Mudki, a village near Ferozpur, is famous as the scene of the first battle between the Sikhs and the British in 1845.

Multan (86), the chief town of the district of the same name, on the railway from Lahore to Karachi, distant 576 miles, is on the River Chenab. It is one of the most ancient towns in the province, and very famous in history, for it is one of the great frontier towns of India. It is, next to Jacobabad, where the thermometer often rises to 120°, the hottest town in the Punjab, but has a very cold winter. It is a military cantonment. As a trade centre it is of the first importance. It is connected by rail and by river with all the towns in central Punjab, and all the exports and imports pass through it The chief import is cotton, the exports are wheat, sugar, cotton, indigo, and wool. It has many industries in silk, cotton, carpet mats, and famous pottery, and making of tin boxes.

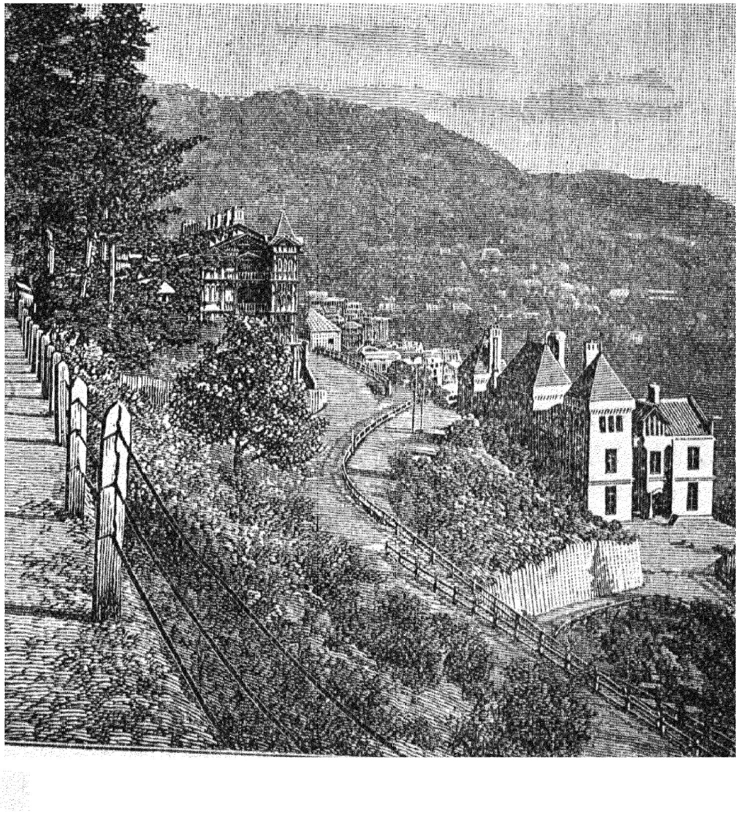
Murree is a hill-station in the Himalayas, 7500 feet high, 39 miles north of Rawalpindi. It is a beautiful place with lovely views of the snow-clad peaks of the Himalayas. It has a well-known brewery. In the hot season it is full of visitors from the plains.

Pānipat (27), on the Delhi-Ambāla Railway, is probably the most ancient town in the province. It is celebrated for three great battles which decided the fate of Northern India. Here Babar defeated Ibrahim Lodi in 1526, here Akbar overthrew Hemu in 1556, and here Ahmad Shah crushed the Mahratta power in 1761 It has now several thriving industries.

Rāwalpindi (97), is the most important military cantonment in India It is on the North-Western Railway, on the plateau in the north-west corner of the Punjab. It has large trade, many industries, and the workshops of the North-Western Railway. There is an annual horse-fair, the largest in the Punjab.

Sialkot' (65), north of Lahore, which is 72 miles distant by rail, has a large military cantonment. It is a flourishing centre of trade and many thriving industries, including the making of cricket bats, tennis rackets, and hockey sticks. It is one of the sacred cities of the Sikhs, for it has the shrine of the first Sikh guru, Baba Nanak.

Simla (12), the summer capital of the Government of India, is on a ridge, being a spur of the Himalayas, 7200 feet above sea-level. It is distant 1176 miles by rail from Calcutta, and 1112 from Bombay. There is a mountain railway up to it from Kalka, at the foot of the hills. There are splendid views of the Himalayas all around. Simla has numerous public offices and several good schools for Anglo-Indian boys. There are over 2000 houses for Europeans and Anglo-Indians and their servants,



The temperature at Simla ranges from 67° to 41°. The rainfall is 70 inches. Snow often falls in winter.

Sobraon (5), on the Sutlej, south of Lahore, was the scene of a famous battle between the Sikhs and the British under Sir H. Gough in 1846. It ended the first Sikh war.

Ludhiana (49), is an important railway junction between Lahore and Ambāla. It manufactures beautiful cashmere shawls. Other industries are ivory carving, cotton and woollen weaving and spinning, and the dyeing of wool and silk.

Thāneswar, on the banks of the Saraswati, and the Delhi-Ambāla Railway, north of Panipat, is famous as the most sacred place in the holy land of Kurukshetra, the scene of the great battle described in the *Mahabharata*. It is a great place of pilgrimage, attended, at solar eclipses, by half a million of pilgrims.

NATIVE STATES IN THE PUNJAB.

Under the Punjab government there are forty-three States. Their area is 36,500 square miles, with a population (in 1921) of about 4,415,000.

There are three classes of these States: (1) the hill States in the Punjab Himalayas which are ruled by some of the most ancient Rajput families in India, (2) the large Muhammadan state of Bahawalpur; (3) the Sikh States and Muhammadan chiefships. The chief States are:

BAHAWALPUR, with an area of 15,000 square miles and a population of about 780,000. It is a long strip of country about 300 miles in length, and about 40 miles wide, lying between the Indus and Rajputana. Most of this tract is a desert, but it has a strip of fertile alluvial land in the valley of the Indus called "the Sind." The ruler is a Nawab. The chief crops are wheat, rice, and millets. The capital is **Bahawalpur** (18), on the Indus.

CHAMBA is a small and beautiful hill State to the south-east of Kashmir, watered by the Ravi and Chenab. It is almost surrounded by lofty mountain ranges, some of the peaks being 20,000 feet high.

The **Phulkian States** include Jind, Patiala, and Nabha. They are also known as Cis-Sutlej States, being to the east of the Sutlej.

PATIALA is the largest and most populous of these States. The population is about 1,500,000. The chief town is **Patiala** (51), where the Maharaja lives and the Political Agent of the Phulkian States resides. It is on the railway, and has several fine public buildings.

KAPURTHALA is a small State, having an area of 650 square miles, and a population of about 284,000. The chief is a Sikh. The chief town, **Kapurthala** (19), has many handsome public buildings and a college.

38. DELHI.

DELHI, the smallest province in India, was separated from the Punjab and constituted a separate province in 1912. The area is 557 square miles and the population (in 1921) about 487,000. The population of Delhi City is 303,000, making it the seventh city in India in size.

The transfer of the seat of the Government of India, formerly at Calcutta, to Delhi, was announced at a great Durbar held in Delhi by the King Emperor on December 12, 1911, and the foundation-stone of the new capital was laid by His Majesty on December 15, 1911.

New Delhi is now being built (1921), and is to cover 25 square miles, with spacious parks and public buildings.

Delhi, like London, is a great nodal city Six railways run into it, the River Jumna flows past it, and good metalled roads lead from it in every direction. The Western Jumna Canal also connects Delhi with other places, and is navigable all the year round. It is distant 956 miles from Calcutta, 982 from Bombay, and 907 from Karachi.

Delhi was the capital of India under many ancient lines of Hindu kings, and latterly under the Pathan and then the Mughal emperors. It extends two miles along the Jumna, and is enclosed on the other three sides by a high stone wall

3¼ miles in length, with several gates. It is full of splendid buildings, erected by Shah Jahan and other emperors, the Red Palace of Shah Jehan, the Diwan-i-Khāss and the Diwan-i-Am, the great Halls of Private and Public Audience, the Jama Masjid or great mosque, and many more. The main street, the "Chandni Chouk" or Silver Street, is three-quarters of a mile long and 74 feet broad, with a double row of trees down the centre. For many miles around the city there are mosques, tombs, and buildings. One of the most famous is the Kutb Minār, a minaret or marble column 238 feet high It was begun in the year 1200 by Kutb-ud-din Aibak and completed by his successor. It is in five lofty stories with balconies between them. On the fluted stones are verses from the Koran in Arabic letters.

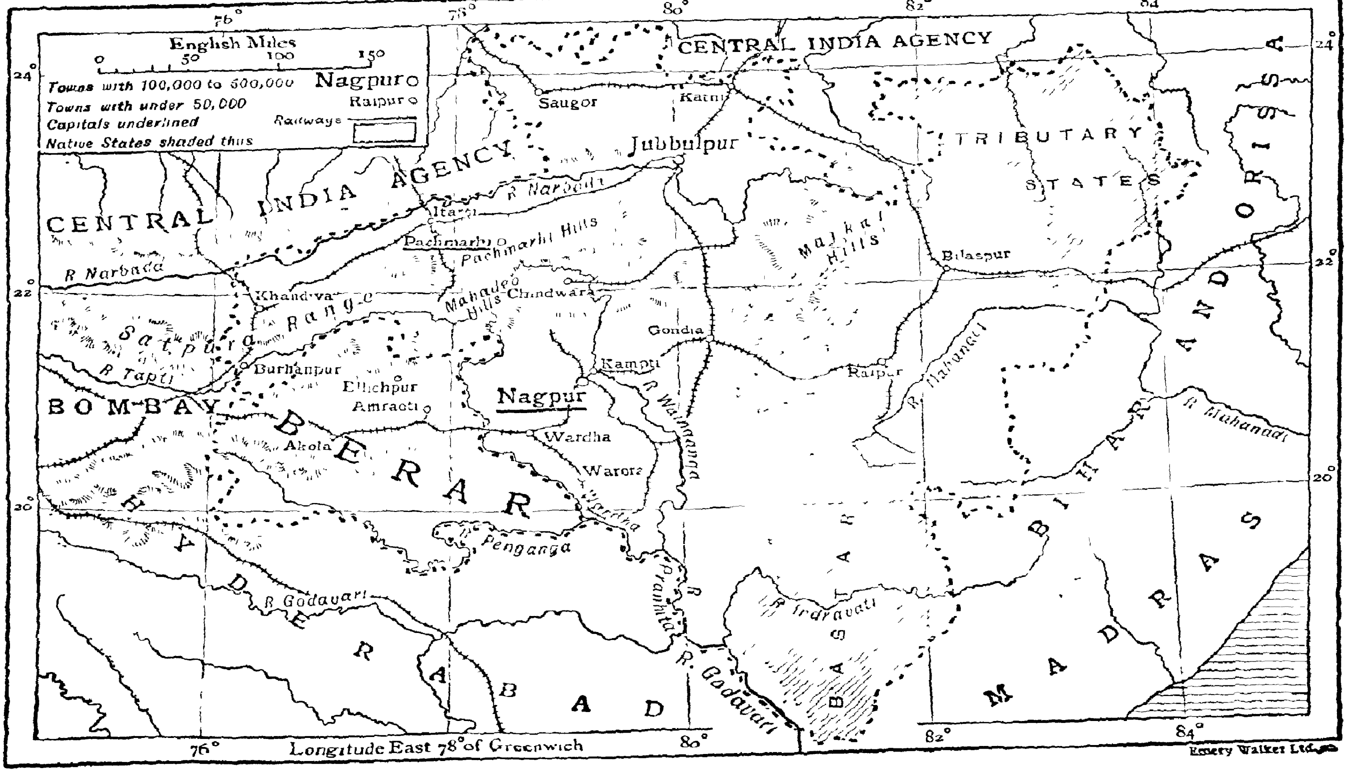
The industries of Delhi are many and varied, comprising jewellery, brass and copper ware, ivory-carving, pottery, weaving, gold and silver embroidery, and painting on ivory. There are also mills and factories for spinning and weaving cotton, making flour and biscuits, and sugar. The city is a great educational centre, with many schools of all grades.

The city lies at about 700 feet above sea-level, this being the height of the level of the plain of the Ganges at this point. The temperature varies from 93° in the hot season to 60° in the cold season. The annual rainfall is 27 inches.

39. CENTRAL PROVINCES AND BERAR.

THIS province is under a Chief Commissioner. It is situated in the centre of the peninsula, in the broad belt of hill and plateau which separates the plains of Hindustan from the Deccan, and was known in ancient times as **Gondwana.** It is about 500 miles from north to south, and about 500 from east to west. About one-fourth of this area is included in fifteen Native States (shaded in the map), the largest being **Bastar** in the south. **Berar,** or the **Hyderabad Assigned Districts,** has been "leased in perpetuity" by H.H. the Nizam

CENTRAL PROVINCES AND BERAR



to the Government of India, and is now under the Governor of the Central Provinces.

There are five natural regions, three being upland and two plain. These are –

(1) A part of the plateau of Malwa around Saugor in the north-west, lying north of the Narbada River, at a height of 1500 to 2000 feet. (2) The long narrow valley of the Narbada walled in by the Vindhyas to the north and the Satpuras to the south. It extends westwards for about 200 miles from Jubbulpur, with a width of about 20 miles. It is covered with rich alluvial soil, washed down by many streams from the hill ranges on both sides. (3) An elevated plateau rises south of the Narbada valley, being the eastern extension of the Satpuras. It has an elevation of 2000 feet, but the Maikal Hills, which rise from it, have peaks 3500 and 4000 feet high. The eastern end is known as the plateau of Amarkantak. Near it rise the Narbada and Tapti. (4) South of the Satpuras lies the plain of Nagpur, watered by the Wardha and Wainganga. It is covered with black cotton soil, and is the great cotton-growing tract and the most wealthy part of the province. The Mahanadi waters the eastern part of the plain, which is divided by the Maikal Hills from the Nagpur plain, and lies around Bilaspur and Raipur. (5) South of these plains rises a large tract covering about 24,000 square miles, an expanse of hill and plateau, mostly covered with dense forest and thinly peopled by tribes of Gonds. It includes the State of Bastar.

The rivers of the province are the upper and middle courses of the Narbada and the Tapti; and the Mahanadi, the Wardha, and the Wainganga, tributaries of the Godavari. They have cut out deep beds for themselves, and are swift torrents in the rains, but nearly dry in the hot season.

The province is a land of hills and valley, thick forests, and many streams. The jungles are full of wild animals—tigers, leopards, bears, wolves, wild dogs, and deer of every kind. The climate is one of extremes, but cool on the hills and in the rains. The average annual rainfall is 47 inches. Most of this rain falls in the south-west monsoon, which blows up the valleys of the Narbada and Tapti, the moist vapour being condensed on the Satpuras.

The four chief languages of the province are Hindi in the north, spoken by 60 per cent of the people, Marathi in the west, Oriya and Telugu in the east and in the south. There are, besides, many dialects, Dravidian and Munda.

Rice is grown in the valleys, and wheat on the uplands. The millets and pulses are also cultivated. Cotton is the most important product. Coal is found in many places, the chief coal field being at Warora, south of Nagpur. Manganese is quarried in several places. The chief manufactures are silk and cotton weaving, cotton dyeing, gold and silver work, brass and copper work, the making of bangles, and working in leather. There are many mills in Nagpur and Jubbulpur. The province is well supplied with railways, which may be seen on the map.

Berar is a broad valley running east and west between the Gawilgarh range of the Satpuras on the north and the Ajanta Hills on the south. The rivers are the Tapti, the Painganga, and the Wardha The plain is a wide expanse of black cotton soil, in which cotton, *jowār*, *til*, and pulse are the *kharīf* or monsoon crops, and wheat, linseed, and gram the *rabi* or cold-weather crops. Marathi is the chief vernacular. The climate is extreme.

Akola is one of the chief centres of the cotton trade in Berar. There are many cotton presses.

Amraoti (35) is a large cotton mart in Berar, with many cotton presses. It was formerly the capital.

Burhanpur (22), in the valley of the Tapti, was the capital of Khandesh under the Mughal emperors. There are many fine old mosques in the city. The town was once the main centre of trade between Hindustan and the Deccan, for it lies in a gap in the Satpuras, commanded by the ancient fort of Asirgarh. There are cotton and spinning factories, and manufactures of silk cloth embroidered with gold and silver.

Jubbulpore (109), the headquarters of the northern division of the Central Provinces, is near the Marble Rocks, the well-known gorge through which the Narbada flows. It is the second city in the province, 1306 feet above sea-level, with a comparatively cool climate It is a large military station with many fine public buildings, and is an important commercial and industrial town, with many mills, factories, presses, and railway workshops. It is nearly midway between Bombay (600 miles) and Calcutta (800 miles) by rail.

Kampti (40) is the chief military cantonment in the province It is 10 miles from Nagpur. It has cotton presses and factories.

Nagpur (150) is the largest town and the capital of the Central Provinces. Close by is the fort of Sitabaldi, famous in history. It is the leading industrial and commercial town of Central India, with great trade with Bombay. There are very large weaving and spinning mills, cotton presses, and printing presses.

Pachmarhi, the sanatorium of the Central Provinces, and summer headquarters of Government, is on a plateau 3500 feet high. The rainfall is 77 inches, nearly all from the south-west monsoon. The heat, however, though much less than that in the plains, is still high, being 85° in May. It falls to 69° in October.

Raipur (35), the sixth largest town in the province, is the headquarters of the Chhattisgarh division. It has a Rajkumar College, for the sons of Indian chiefs.

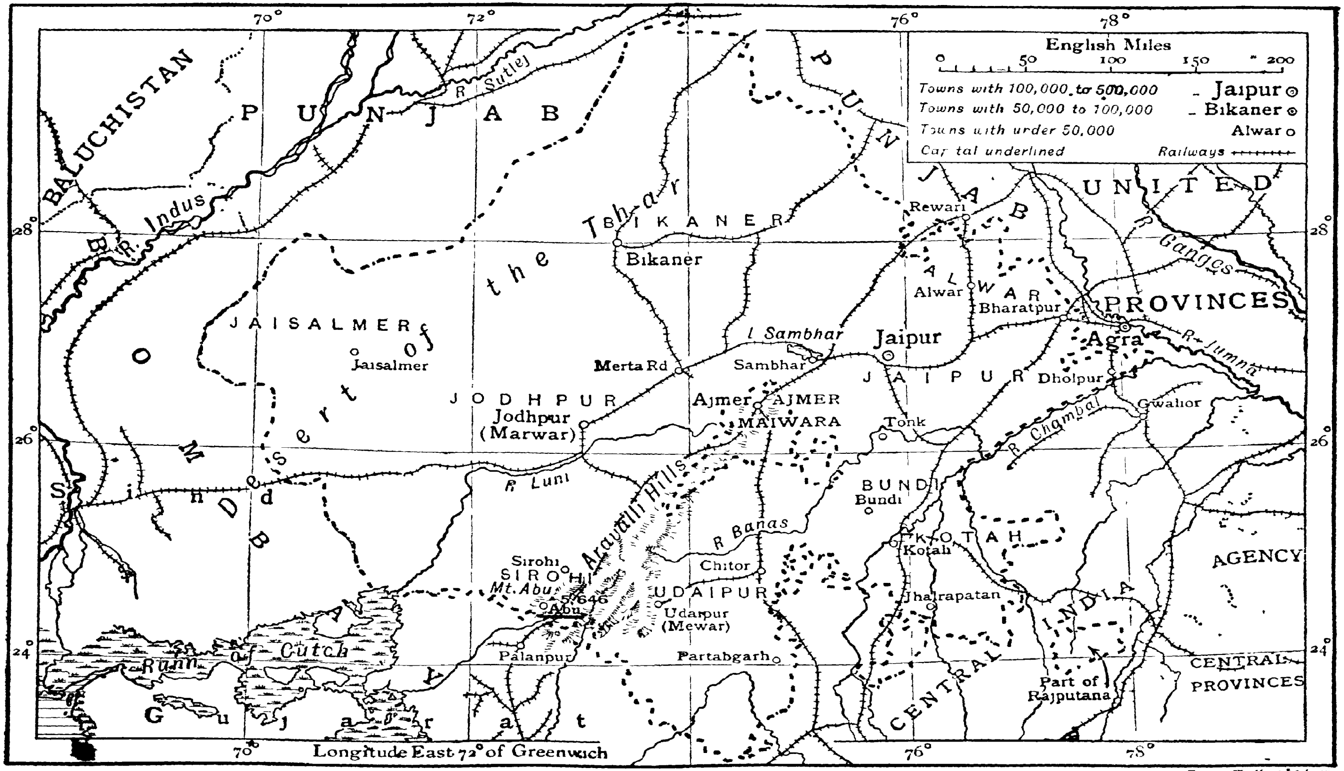
Saugor (45), the third largest town in the province, is a military cantonment.

40. RAJPUTANA.

RĀJPUTĀNA (the country of the Rajputs), also called Rājasthan or Rājwāra (the abode of Princes), is a large territory which includes eighteen Native States, two chiefships, and the small British province of Ajmer-Merwara

The names of the twelve largest States, the area and population of each, and the caste or creed of the ruling family, are

RAJPUTANA



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given in Appendix IV. The position of each State may be seen on the map.

The Aravalli Hills run across the country from south-west to north-east, dividing it into two parts Three-fifths are in the western part called Western Rajputana, and two-fifths in the eastern part known as Eastern Rajputana

Western Rajputana stretches along the southern Punjab frontier, from Sind to near Delhi It is a sandy, ill-watered tract, the west and south-west being the desert of the Thar. Most of it is covered with sand-hills from 50 to 100 feet high. The few inhabitants move from place to place, as they find water in their wells.

The only river is the Luni, which rises in the north of the Aravallis and flows along the eastern border for 200 miles into the Runn of Cutch.

The second division is a higher and more fertile region. It has long hill ranges and stretches of wood-land, many streams and rivers, fertile table-lands, and good soil. The Udaipur country east of the Aravallis is a plateau 800 to 900 feet above the plains. Streams, running down from the Vindhyas, water the south-east of Rajputana, the chief being the **Chambal** and the **Banas.**

The **Sambhar Lake** is a well-known salt lake which has been described already.

Mount Abu is a peak 7 miles south of the Aravallis, standing alone and rising into a plateau 4000 feet above the sea. It is 12 miles long and from 2 to 3 miles broad. On it there is a peak 5650 feet high, called **Guru Sikhar**—the highest point between the Himalayas and the Nilgiris. The climate is pleasant and healthy, the mean temperature about 69°. There is a beautiful lake on the summit The sides and base of the mountain are densely wooded. The station is the sanatorium for Rajputana.

The finest Jain temples in India, known as the **Delwara,** are on Mount Abu. There are five of them. The Agent to the Governor-General is stationed at Abu.

The climate in Rajputana is one of great extremes except in the hills. The heat is great everywhere, and in the west and north-west very great in summer. In winter there is often frost at night. The air is very dry. The thermometer often ranges from 90° in the day to below 32° at night. The rainfall in the west is rarely more than 6 or 7 inches, and in the desert there is often no rain at all. But on the Aravallis there is fairly heavy rainfall, and sometimes as much as 100 inches fall at Abu. In Eastern Rajputana there is abundant rain.

The chief language spoken is *Rajasthani*, of which there are at least sixteen dialects, the most important being Mārwāri, the vernacular of over 4 millions. Other languages are Western Hindi and Urdu. The chief dry crops are *jowār* and *bājra.* There are hundreds of thousands of wells, and crops are watered from them in many places. The most important mineral is salt, which yields a large revenue. The manufactures are the weaving and dyeing of cotton cloth, the making of woollen rugs, and enamelling on gold, for which Jaipur is famous. There is also metal work and pot-making.

Alwār (45) is the capital of the Alwar State.

Ajmer (114) is the capital of the small province of Ajmer-Merwara. It lies at the foot of Tara-garh Hill (2800 feet high), and has many ancient buildings and a strong fort built by Akbar. The station is a great railway centre with much trade. The Mayo College for the sons of Rajput chiefs is well known.

Bharatpur (47), the capital of Bharatpur State, is the sixth largest city in Rajputana. It has a strong fort famous in Indian history.

Udaipur (46), the capital of the State of Mewar, or Udaipur, is the fifth largest city in Rajputana, and the most beautiful. It is built on an island on a large lake with wooded hills around it.

Bikaner (69), capital of the Bikaner State, is the fourth largest town in Rajputana. It is a handsome city with a strong fort built of stone 6 feet thick and 25 feet high. There are many Jain temples and mosques in it. There are manufactures of sugar-candy and woollen shawls and rugs.

Bundi (20), the capital of the Bundi State, is in a gorge surrounded by wooded hills, and is enclosed with huge walls.

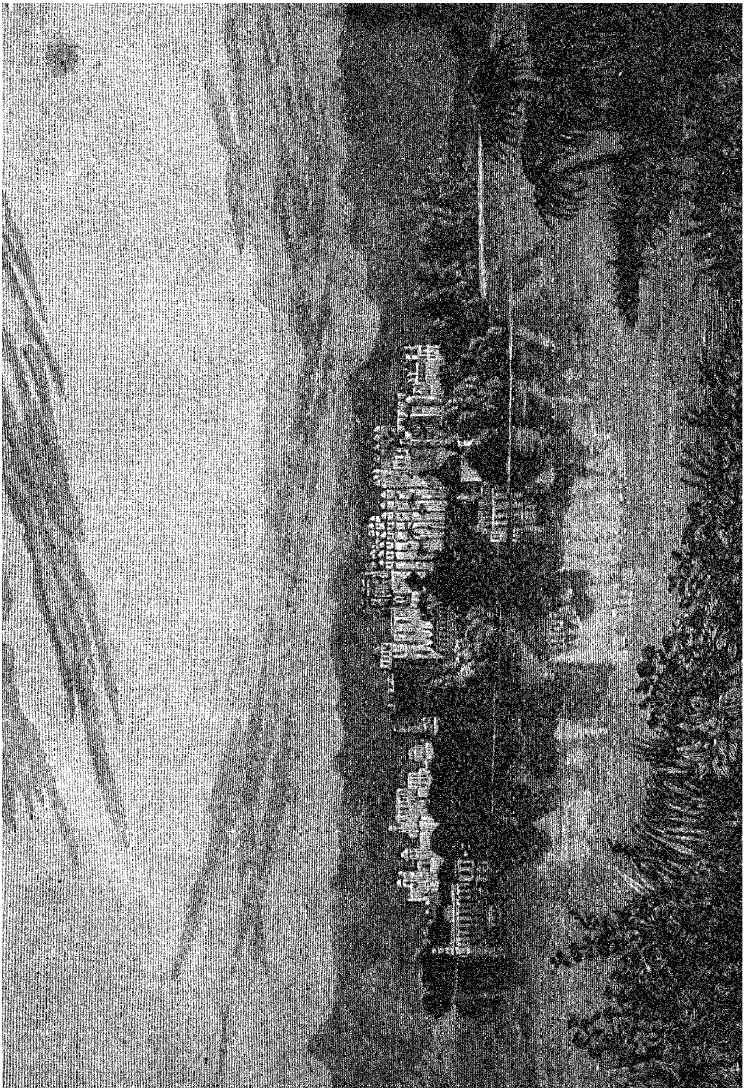


FIG. 110.—THE PALACE, UDAIPUR.

The palace, built on a hill 1400 feet high, is one of the finest in Rajputana. There are other splendid buildings.

Jaipur (120), the capital of Jaipur State, is the largest city in Rajputana. It was built by Jai Singh. A strong stone wall, 20 feet high and 9 feet thick, encircles the city, which is surrounded by fortified hills. There is a splendid palace and wide streets, some of them 100 feet wide. A remarkable building is Jai Singh's Observatory, with pillars and sun-dials of huge size. There are large banks and banking-houses in the town.

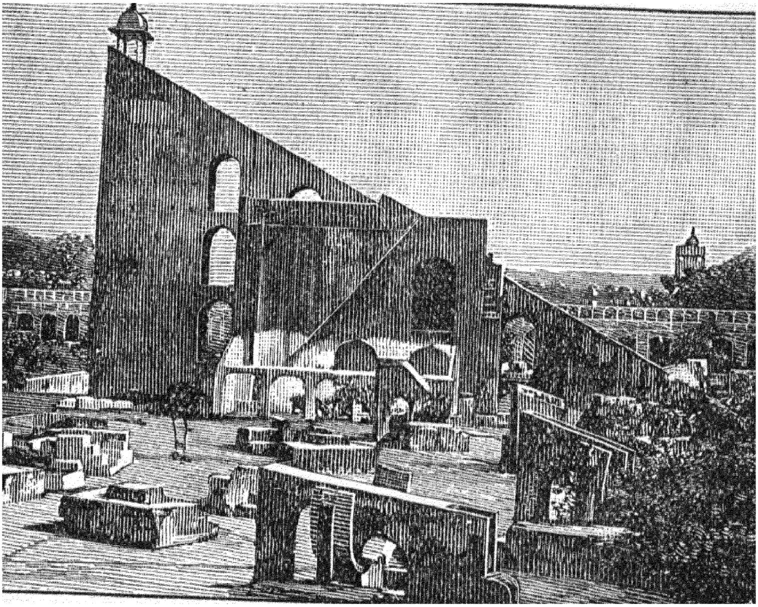


Fig. 111 —Jai Singh's Observatory, Jaipur.

Jodhpur (73), the capital of Mārwār, the largest State in Rajputana, is a city in a desert land. There is a strong fort, the finest in Rajputana. There are handsome buildings, temples, and palaces in it.

Kotah (34), the capital of Kotah State, is a strongly fortified city on the River Chambal.

41. CENTRAL INDIA AGENCY.

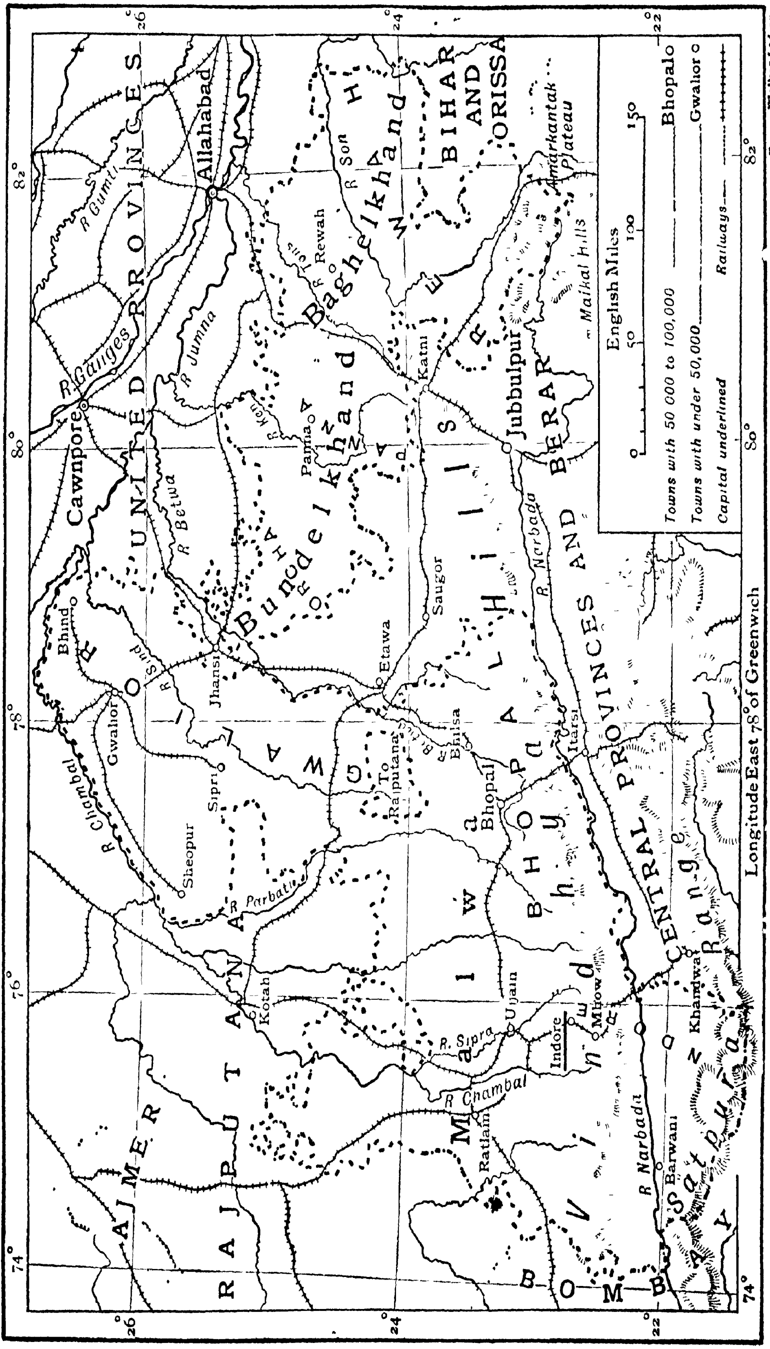
CENTRAL INDIA is not a province of British India but an *Agency* or collection of about 150 Native States, under an Agent to the Governor-General who lives at Indore. It lies to the north of the Vindhya range of mountains, which separates it from the Central Provinces. The latter province is a part of the Deccan; the former is a part of Hindustan.

The States included in the Agency cover an area of about 77,000 square miles, with a population of about 9⅓ millions. This area falls into three natural regions—a plateau, a tract of lower plains, and a tract of hills. The *plateau* takes in most of Malwa, a wide table-land about 1600 feet above the sea with an area of about 34,600 square miles, with 102 persons to the square mile. It forms the western part of the Agency, and is divided by the River Betwa from the eastern part. It lies east of Rajputana, and the inhabitants speak Rajasthani. The *plain tract* lies north of the plateau, being the State of Gwalior and the greater part of Bundelkhand It is about 18,000 square miles in extent, and is the most thickly populated of the three regions, having 172 persons to the square mile. Its mean elevation is about 700 feet above the sea. The inhabitants speak dialects of western Hindi. The third or *hilly tract* includes the higher slopes of the Vindhya and Satpura mountains. This region has an area of 25,700 square miles and is very thinly populated, having only 74 persons to the square mile. The inhabitants are chiefly Gōnds, Bhīls, and other non-Aryan tribes, who speak mixed and corrupt dialects of Gujarati, Hindi, and Marathi.

Many rivers and streams water the country. They flow northwards from the Vindhyas into the Jumna, and include the Betwa, Chambal, the Mahi, the Parbati, the Sipra and many more.

There is a marked difference between the climate on the plateau and in the plain. The former is hotter but more equable than that of the plain, which has greater extremes of heat and

CENTRAL INDIA AGENCY



cold. The average rainfall on the plateau is 30 inches, and in the plains 45 inches.

The chief crops in Central India are jowār, grain, wheat, pulses, cotton, and rice Maize, oil-seeds, and poppies are also cultivated. Opium and salt yield a large revenue.

The largest States are Gwalior, Rewah, Indore, and Bhopal.

Gwalior State is ruled by a Maharajah, a Mahratta by caste, of the Sindhia (or Shinde) family. **Gwalior** city (46) lies at the foot of a fort that has been famous for 1000 years. It stands on a droog or great rock 300 feet high. In it there is Mān Singh's splendid palace, and many temples and shrines. The modern capital is **Lashkar** (90), with large trade and many public buildings.

Indore State is ruled by a Mahratta Maharaja of the Holkar family. The capital, **Indore** city (93), is 1738 feet above sea-level. It is one of the largest trade centres in Central India, with many exports and imports. In it is the residence of the British Agent, and it has many palaces and public buildings. The young Indian princes of the States are educated at the Daly College in Indore.

Rewah is the largest State in the eastern half of Central India, in the country called Baghelkhand The Kaimur Hills run through it. It is watered by the River Tons, a tributary of the Ganges. In the south of the State stands the sacred plateau of Amarkantak with the sources of three great rivers: the climate is extreme, the rainfall 41 inches. It is a country of hills and forests. **Rewah** (25) is the capital.

Bhopal is an Agency with 25 States under a British Agent, the chief State being **Bhopal.** This State is ruled by a Pathan family, the present ruler being a princess styled the Nawab Begam. It is, next to Hyderabad, the most important Muhammadan State in India. It is south-east of the plateau of Malwa, and is a fertile, well-watered country, growing much cotton. In it is the great Sānchi Buddhist mound, built in the 3rd century B.C. **Bhopal** city (55), on a ridge 1650 feet high, is the capital. It is a beautiful city, built on the banks of two great lakes by Rajah Bhoj 1000 years ago.

42. NORTH-WEST FRONTIER PROVINCE.

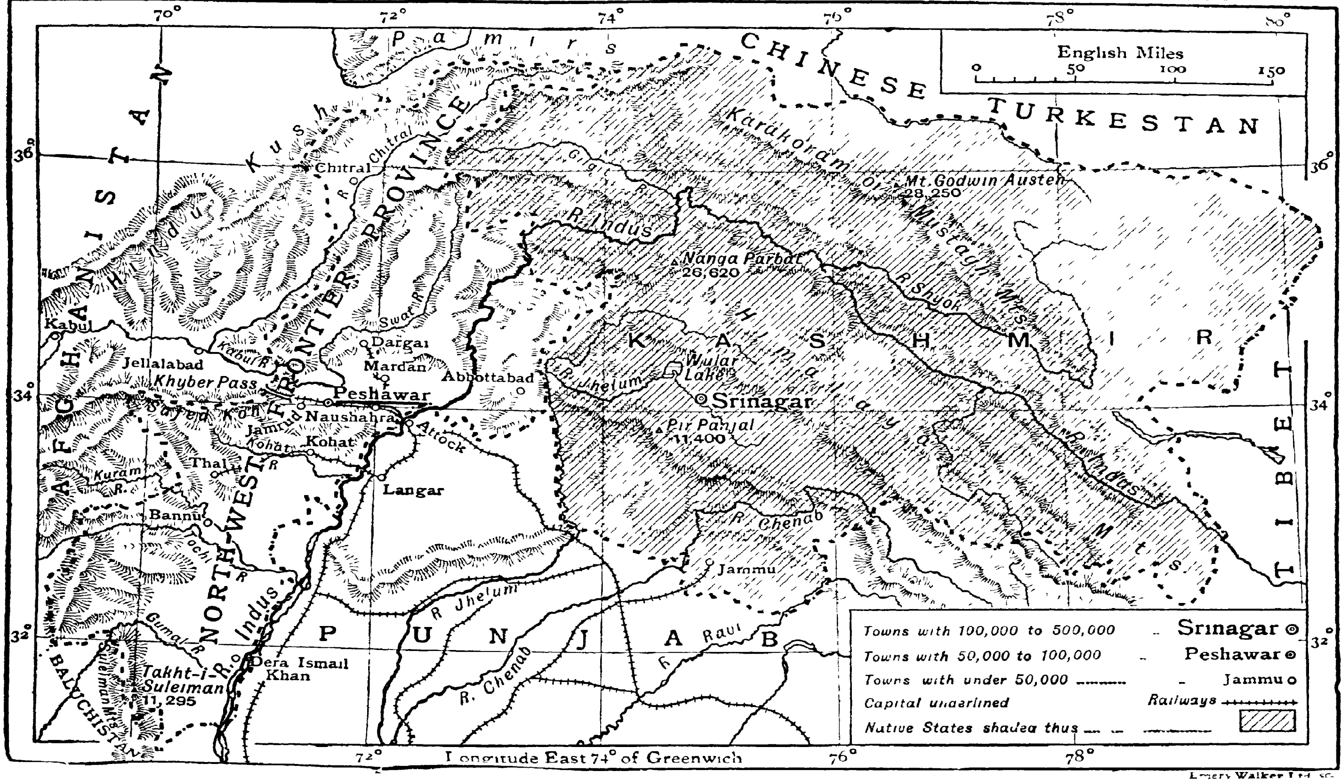
THIS province, as its name shows, is in the north-west corner of India on the frontier. It lies between the Indus and the Hindu Kush and Suleiman Mountains, the great mountain ranges which form the natural boundary of India on the north-west and separate it from Afghanistan. It extends through six degrees of latitude in the warm temperate zone, its extreme length being about 400 miles, its breadth 280 miles. It includes 38,600 square miles, of which about 13,000 are British territory, with a population of about two million and a quarter, the remainder being occupied by Pathan tribes under the control of the Chief Commissioner. The British territory is in the east of the province, along the Indus. The Native Hill States are in the west, along the base of the hills.

There are three natural regions—a small tract east of the Indus known as Hazara, round Abbotabad; secondly, the narrow strip between the Indus and the hills; and thirdly, the hills themselves, *i.e.* that part of them which lies east of the boundary line between India and Afghanistan. The first two regions are more or less hilly; but there are two fertile plains, one in the far north of Hazara, the other in the south, being the valley of the Kuram River.

There are many rivers in the province, some flowing south and some east, but they all run down into the Indus Most of them have cut out deep gorges in the hills, and their current is so very rapid that they cannot be navigated. The chief of them are the Gilgit, the Swat, and the Chitral flowing south, the Kabul, the Kohat, the Kuram, the Tochi, and the Gumal flowing east. Along the valley of each of these rivers there is a pass leading down into the province from Afghanistan and the Hindu Kush.

The climate varies very much. In the south the tract along the Indus, from the Kohat to the Gumal, is one of the hottest parts of India, while over the mountain region to the north the weather is temperate in summer and very cold in winter. The air is very dry, the climate extreme.

NORTH-WEST FRONTIER PROVINCE AND KASHMIR



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The rainfall is, as a rule, very small, being brought by such scanty winds as find their way up from the Arabian Sea and the Bay of Bengal in summer, and a few storms from Mesopotamia and the north of Persia. It varies from 15 inches in Abbotabad to 10 to 25 inches in Peshawar and 9 inches in the southern plain west of the Indus. The thermometer rises in Peshawar to 120°, in Dera Ismail Khan to 122°, and to 108° in Chitral. But it falls in winter to 10° in Chitral, in Peshawar to below 32°, and in Dera Ismail Khan to 30°.

The province contains one large city—Peshawar—and three other towns with more than 10,000 inhabitants—Dera Ismail Khan, Kohat, and Charsadda. The villages are nearly all walled, and almost every family has a house which is a stronghold, for until lately there was constant fighting between the tribes and villages in this country.

Most of the people of the province speak Pashtu, which is an Aryan language. In the north it is called Pakhtu. There are many dialects. Punjabi is the language spoken by a large number. Over nine-tenths are Muhammadans, so that this is the most Muhammadan province in India.

The chief crops are wheat and barley. Next come grain, maize, *bajrā*, and *jowār*. A little cotton is grown. The fruits cultivated are grapes, peaches, plums, pears, figs, pomegranates, water-melons, and dates. Of these the chief is the pomegranate, which is largely exported to India. The only mineral is *salt*, quarried in Kohat. The manufactures are woollen rugs and blankets, wax-cloth, silk-weaving, and the making of caps, copper vessels, and earthenware.

As the N.-W. Frontier Province is the land-gate to India on the north, there are many strong forts with garrisons to guard the Empire on that frontier. The chief of them are at Peshawar, Mardān, Naushahra, Kohat, Bannu, and Dera Ismail Khan. The position of each of them is shown on the map. **Jamrud** is a fort at the entrance to the Khyber Pass at the end of the railway from Peshawar.

Abbotabad, the chief town in the Hazara district, is 4000 feet above the sea, and has a strong garrison.

Bannu (also called Edwardesabad), on the River Kuram, has a strong garrison and a good deal of trade.

Dera Ismail Khan (32) is 4 miles from the right bank of the Indus, and has a strong garrison Large caravans of Afghan traders pass through it twice a year on their way from the Gomal Pass into India.

Peshawar (94), the capital of the province, is 10 miles from the entrance to the Khyber Pass. It is a very ancient town, famous in every period of Indian history, for it may be called the Gate of India. It is an entrepôt for trade for Central Asia. Numerous caravans come to it from Kabul and Bokhara, bringing raw silk, wool, resin, fruits fresh and dried, gold and silver lace, skins, mats, and fibres. They take back cotton piece-goods, silk, sugar, salt, tea, and spices. There is a strong military garrison.

KASHMIR AND JAMMU.

These Native States form one large territory under one Maharajah. They are the most northerly country in India. It is called Kashmir by the English and Jammu by Indians. Its length from north to south is about 310 miles, and its breadth from east to west about 400 miles It has an area of about 81,000 square miles and a population of about 3 millions. Kashmir is the valley of the Jhelum, and Jammu is the valley of the Chinab.

Kashmir is a lovely land of mountains and valley, with one of the finest climates and the most beautiful scenery in the world. In the centre lies the green "Vale of Kashmir," about 80 miles long and 25 broad, at an elevation of 6000 feet, surrounded by snowy mountain ranges 18,000 feet high, looking, as it has been said, "like an emerald ring set in pearls" To the south of the vale there is a huge mountain range known as the *Pir Panjal*, about 180 miles long, lying between the Jhelum and the Chenab. It has peaks rising to 14,000 and 15,000 feet. After this we come to the Himalayas, with their lofty peaks 20,000 feet high covered with eternal snow.

Two-thirds of the people are Muhammadans. They speak

Kashmiri. The chief crop is rice. All the European fruit-trees flourish in Kashmir, and apples of many kinds, pears, grapes, and almonds are largely cultivated There are plantations of mulberry, and silk is now widely made. The chief exports are ghi, skins, hides, fruits, and drugs.

Srinagar (112), the capital, stands on the River Jhelum, at a height of 5250 feet. Here the Maharajah lives in summer. The temperature varies from 33° to 71°. Snow falls in winter to the depth of 8 feet. The annual rainfall is about 26 inches. Beautiful shawls were once made here and were famous all over the world, but the industry has nearly died out. Carpets are made, and there is beautiful silver and copper work and wood-carving.

Jammu (31), the winter residence of the Maharajah, is at the foot of the Himalayas.

43. BALUCHISTAN.

BALUCHISTAN, the most westerly part of the Indian Empire, forms the south-eastern end of the table-land of Iran. It is a tract about 550 miles long and 450 miles broad, "a land of barren mountains, sandy deserts, and stony plains." The climate is one of extremes of heat and cold, the rainfall is uncertain and scanty. The products are the same as those of Afghanistan. The country includes (1) **British Baluchistan** (see Map 8); (2) the Agency territories under the British Government, (3) the Native States (coloured yellow in the Map) of Kalat and Las Bela. The State of Kalat is ruled by its Khan, Las Bela by a chief termed the Jām. The population of Baluchistan was (in 1921) about 835,000, about half being in British territory. The religion of the Baluchis is Muhammadanism.

Quetta (24), the chief city of British Baluchistan, is in a valley 5500 feet above the sea. It has a strong fort with a large garrison, and commands the Bolan Pass leading into the Punjab, which is connected by rail, through the Pass, with Quetta.

44. BURMA.

BURMA is the western part of a great peninsula known as Indo China, which stretches out from the south-east of Asia far into the Indian Ocean, between the Bay of Bengal and the China Sea. It is the easternmost and the largest province of the Indian Empire, and is sometimes called Further India It covers an area of 237,000 square miles, of which 169,000 are British territory, and 68,000 belong to Native States. Its greatest length along meridian 98° of E. longitude is about 1200 miles, and its greatest breadth about 500 miles.

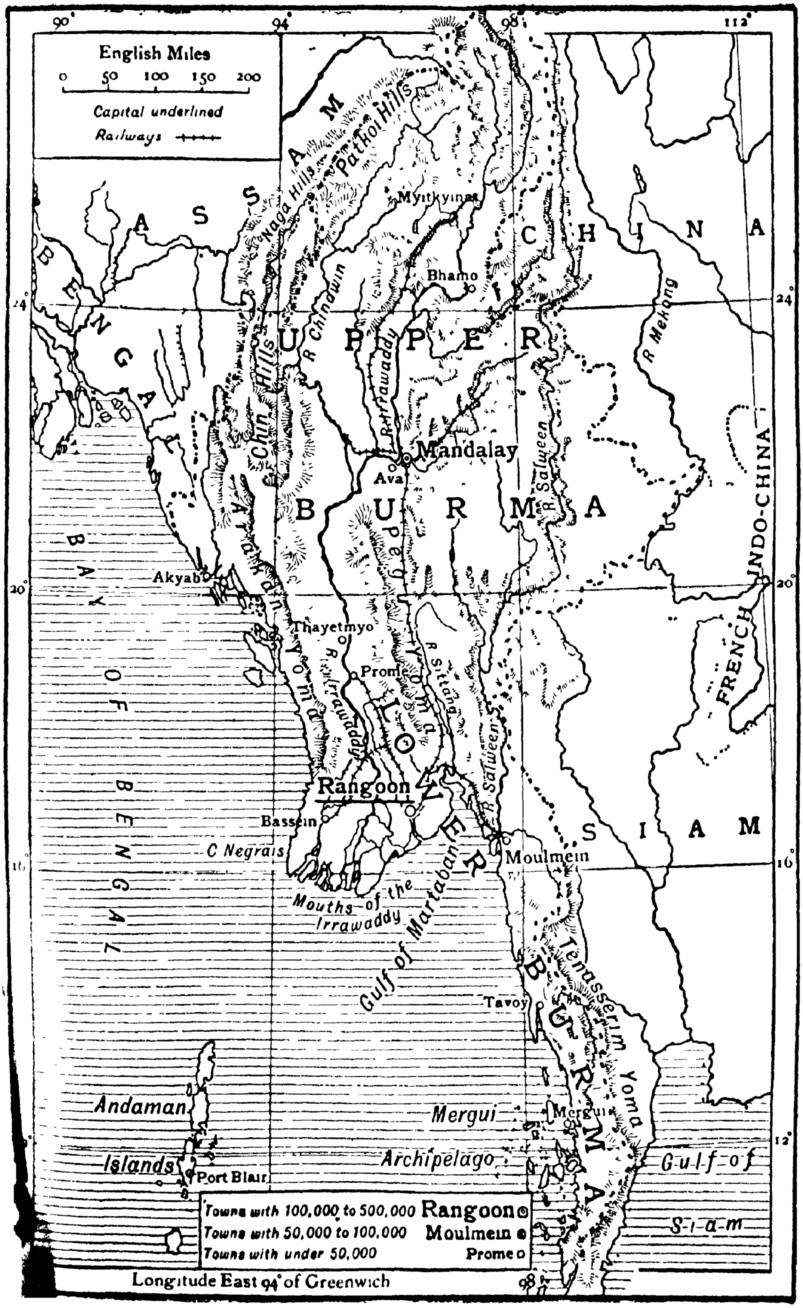
The natural divisions of Burma are long river valleys lying between ranges of mountains, called Yomas, that extend from the far north to the extreme south, with a wide coastal plain. These are very clearly shown on the physical map of India and Burma (Map 6), where the long lines of green are the valleys between the Yomas, which are coloured brown Three great rivers flow down these valleys into the sea. They are the Irrawaddy with its tributary the Chindwin, the Sittang, and the Salween. The wide delta of the Irrawaddy forms a large coastal plain of rich alluvial soil. A narrower plain runs right along the coast for 1200 miles.

That part of the province north of the 20th parallel of latitude is known as Upper Burma, while all the southern part is Lower Burma.

Upper Burma has two natural regions. The western, or maritime region is **Upper Burma wet.** Here the rainfall is about 70 inches **Upper Burma dry** is an inland region shut out from the south-west monsoon by high ranges of hills. It is an arid belt of country, being a plateau with a rainfall of about 37 inches.

Lower Burma has two natural regions likewise. **Lower Burma wet** lies next the sea and is exposed to the full force of the monsoon from the south-west and south. It has a heavy rainfall of 180 inches, much the same as that of the west coast

BURMA


English Miles
0 50 100 150 200
Capital underlined
Railways
90°
94°
98°
112°
24°
20°
16°
12°
ASSAM
BENGAL
Patkoi Hills
Naga Hills
Myitkyina
CHINA
Bhamo
R Chindwin
UPPER
R Irrawaddy
Chin Hills
R Mekong
Mandalay
Ava
R Salween
BURMA
Pegu
Arakan Yoma
FRENCH INDO-CHINA
Akyab
BAY OF BENGAL
Thayetmyo
Prome
R Sittang
R Irrawaddy
Yoma
LOWER
Rangoon
R Salween
Bassein
C Negrais
SIAM
Moulmein
Mouths of the Irrawaddy
Gulf of Martaban
Tenasserim Yoma
BURMA
Tavoy
Andaman Islands
Mergui Archipelago
Mergui
Port Blair
Gulf of Siam
Towns with 100,000 to 500,000 Rangoon
Towns with 50,000 to 100,000 Moulmein
Towns with under 50,000 Prome
Longitude East 94° of Greenwich

of India **Lower Burma inland** is by no means dry, for it has a rainfall of 62 inches, but it is not so damp as the maritime region

The highest peak is in the Chin Hills, which form the northern part of the Arakan Yoma It is **Mt Victoria**, and is 10,400 feet high.

All the hills are covered with heavy forest, which yield valuable timber. The trees are felled and the logs floated down the rivers to the large seaport towns that lie at their mouths and exported. Enormous crops of rice are raised in the river valleys and the coastal deltas.

The **Irrawaddy** is the great river of Burma. It rises in the hills north of the Patkoi and is fed by the snows. It is navigable for 800 miles from its mouth, and the chief towns of Burma are on its banks. Its chief tributary is the Chindwin, in itself a large river with a deep valley. The Irrawaddy forms a vast delta, and on its two chief mouths are the ports of Bassein and Rangoon

The **Salween**, a longer river than the Irrawaddy, rises in Tibet, but its valley is narrow and its current forms many rapids, so that it is not navigable. In its lower course its valley opens out into a wide plain covered with rice-fields Its exact length is unknown, but is probably about 1000 miles.

The **Sittang** is shallow in many places. There are great rocks in its channel, a huge sandbank blocks its mouth, and a strong tidal bore rushes up from the Gulf of Martaban, so that it is useless for navigation. It is about 350 miles long.

The people of Burma all belong to the Mongolian or yellow race of men. There are many tribes who are classed as Tibeto-Burmans and speak different dialects of this family of languages. The chief of them are the Kachins in the north, the Shans in the centre, and the Karens farther south.

The most valuable *minerals* are rubies and jade. Petroleum or kerosene oil is obtained in large quantities and exported to India. There is also a very large export of timber and of rice.

Akyab (38), the fourth largest town in Burma, is a seaport with a harbour on the western coastal plain. It is the chief town in Arakan. It has a rainfall of 200 inches. It has a very large export trade in rice

Ava, on the Irrawaddy in Upper Burma, was the ancient capital. It is now a mere village.

Bassein (31) is on the Bassein River, one of the mouths of the Irrawaddy, and about 80 miles from the sea. It exports large quantities of rice to Europe, and has a good port, which ocean steamers can reach.

Bhamo, in Upper Burma, stretches for 4 miles along the bank of the Irrawaddy, about 700 miles from the sea. It is the gate of the trade with China, which lies to the north.

Mandalay (147) was the capital of the kings of Burma before it was conquered by the British It stands on the east bank of the Irrawaddy, 836 miles by rail from Rangoon. There is a fine palace in the city, in which King Thibaw lived, and a handsome pagoda. It is a military station The climate is dry and hot, but healthy. The temperature ranges from 55° to 100°, the rainfall from 30 inches to 40.

Mergui and **Tavoy** are ports on the coast of the Tenasserim peninsula.

Moulmein (58) is a seaport at the mouth of the Salween, 28 miles from the sea. It has many steam saw-mills and rice-mills, and a large trade in *timber*, which is floated down the river from the forests for export, and in *rice*, to the value of a crore of rupees.

Prome (30) is a large town on the left bank of the Irrawaddy, 160 miles from Rangoon. It is the terminus of the railway from that town.

Rangoon (340), the capital of Burma, is the sixth city in size in the Indian Empire Its rate of growth has been wonderful. It has a good harbour with enormous trade. The Shwe-dagon pagoda, with its gilded roof, is the finest in Burma. The chief export is rice, to the value of many crores of rupees. Teak is also exported to the value of over a crore.

45. CEYLON.

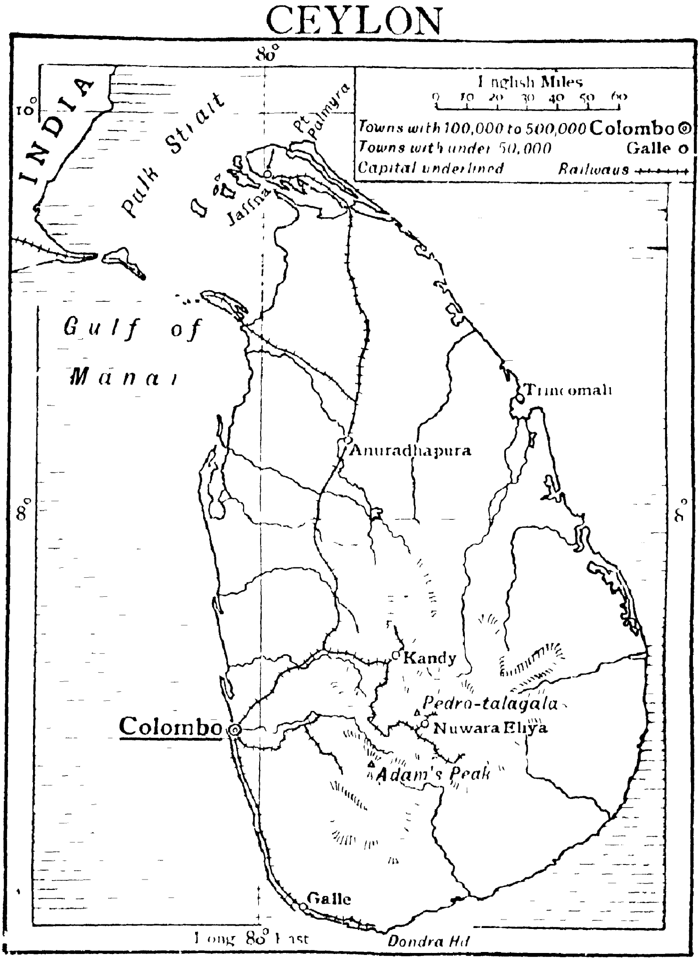
THIS large island lies in the Indian Ocean to the south of India. Ages ago it formed part of India, but is now separated from it by the Gulf of Manar and Palk Straits. The South Indian railway now runs across the island of Rameswaram and the Ceylon railway across the island of Manar. These islands lie opposite to each other on both sides of Palk Straits They are divided by a narrow and shallow channel 21 miles wide, and in this channel there are 7 miles of reefs and small islands in a line known as Adam's Bridge It is proposed to bridge the channel and carry the railway right across from India to Ceylon

Ceylon (or Sinhala, known to Hindus as Lanka) is in shape like a pear with the stalk at the northern end. Its greatest length is 266 miles and its greatest width is 140 miles. It is a little smaller than Ireland. The northern part is a plain. The centre of the southern half is a mass of mountains, the highest points being Pedro-talagala (8300 feet) and Adam's Peak.

Ceylon is within the Tropics, the southern point, Dondra Head, running down to within 6° of the Equator. The climate of the plains is warm, moist, and equable, but the heat is much less oppressive than that of the plains of South India, for it is moderated by the sea-breezes from the surrounding ocean. At Colombo, on the west coastal plain, the yearly range of the thermometer is only 10°—from 76° to 86°. The interior plateau is much cooler At the pleasant hill-station of Nuwara Eliya the thermometer often falls at night to freezing-point. Ceylon lies right in the path of both monsoons. The mean annual rainfall is about 88 inches. The South-west monsoon brings most rain, chiefly on the west coast, on which it "breaks" before it reaches India. The North-east monsoon rain falls chiefly in the north and east of the island. There is rain nearly every month in the year.

On the hills there are forests in which are found wild elephants, wild buffaloes, bears, deer, and monkeys. These forests contain valuable timber trees, *e.g.* ebony and satin-wood. There are many clearings in them, with plantations of tea and rubber.

The large plateau, with its hills and mountains, in the centre of the island, is from 1500 to 8000 feet above sea-level. The chief products of the island are cocoa-nuts and rice in the plains and on the coast, and tea and rubber on the hills. Ceylon is one of the chief tea-producing countries of the world. The yield of rice, though large, is not enough for the inhabitants, and



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the largest import is rice. The chief mineral is plumbago (graphite or blacklead), which is worth 8 lakhs of rupees annually. There are over 2000 quarries, from which rubies, cat's-eyes, and sapphires are taken. Pearls are obtained from oyster beds in the Gulf of Manar.

The population (in 1913) was a little over 4½ millions, including 8500 Europeans, 28,900 Eurasians and Burghers, or descendants of the old Dutch settlers, about 285,000 Muhammadans called Moors; and about a million of Tamil Hindus, of whom about a half are coolies on the plantations. The rest are native Sinhalese, who are Buddhists

Ceylon is a Crown colony, administered by a Governor, who is aided by an Executive Council of seven members, to whom fourteen more are added to form a Legislative Council, ten being non-official.

ISLANDS

The Maldive archipelago, 400 miles west of Ceylon, includes seventeen groups of islets covered with cocoa-nut palms. The islanders are Muhammadans who speak old Sinhalese. There are about 72,000 of them, fishermen and traders, like the Mappilas of South India. They are ruled by a Sultan who pays tribute to the Government of Ceylon.

Colombo (244), the capital of Ceylon, has a splendid harbour, strongly fortified, and is a great coaling station, lying on the route between Europe, Australia, and China. **Galle** (39), in the S.W of the island, has a good harbour. **Nuwara Eliya** (6210 feet high), on the western slope of Pedro-tala, is the chief hill-station, with lovely scenery. **Jaffna** (42), a large town at the northern end of the island, has much trade with India across Palk Straits **Kandy** (32), the old capital of Ceylon under its native rulers, is a beautiful place on the banks of a lake 2000 feet above sea-level. **Trincomali**, on a small bay on the eastern coast, has a very good natural harbour, and was for a long time a naval station.

PART II

46. RIVERS AND THEIR WORK.

How Water circulates.

The sun shines upon the ocean, the water is warmed, and vapour rises into the air. The winds carry the vapour over the land till they come to rising ground, to hills or mountains. The winds blow up the slopes of the hills and soon reach colder regions of the air. There the water-vapour condenses into clouds. As the clouds are carried upwards into still colder air, they condense into rain. The rain falls on the hills and runs down the slopes as a river into the plains below. The rivers flow on to lower ground till at last they reach the sea. The fresh river water mingles with the ocean water. Once more it evaporates, and goes through the same round of changes as before.

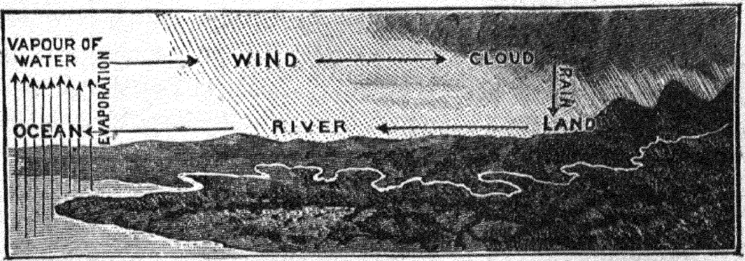

Fig. 112.—Circulation of Water.

This going round and round, this "circulation" of water, may be seen in Fig. 112. The arrows pointing upwards from the ocean on the left, show the rising vapour. The upper arrows pointing towards the land show the direction of the wind. Then come the black clouds and the rain falling from them on the hills.

The long white line below meandering over the land, in the direction of the lower arrow, is the river flowing down to the sea.

The water in the world never stands still. It is true that we cannot always see it moving. We can see the clouds move across the sky, and we can see the rain falling. We can see the rivers rushing down to the ocean. But the water on the quiet surface of a lake seems to be standing quite still. Yet, from the surface of the lake, invisible vapour is always rising into the air, and if no rain fell, or if no stream fed the lake, all the water in it would soon disappear. It would have travelled upwards to the clouds. Immense quantities of rain fall into the sea too, and countless rivers flow into it, and yet the sea never overflows. It loses as much water by evaporation as it gains from the rivers and the rain. The total amount of water in the world remains the same; only it is sometimes in the air, sometimes in the sea, and sometimes on the land.

The *Source* of a river is sometimes said to be in the clouds, and this is in one sense true. But the term "river" is usually applied to water flowing over the land. Its source is where it rises or begins to flow. A river may rise in a spring or a lake, or at the foot of a glacier or field of ice, below the snow-line, where the heat of the air is enough to keep the ice always melting.

Springs.—Part of the rain which falls on the earth runs off to lower levels, but part sinks into the soil. Below the soil and the subsoil, the water finds rock. If the rock be loose or porous like sandstone or gravel, the water sinks through it, till it comes to a bed of rock like clay through which it cannot pass. It finds its way along the surface of this bed till it comes to open ground, often the side of a hill, when it "springs" or gushes out, as in Fig. 113. The water flowing down from it is called a brook, or rill, or rivulet. Lower down it becomes a river, after it has been joined by other brooks,

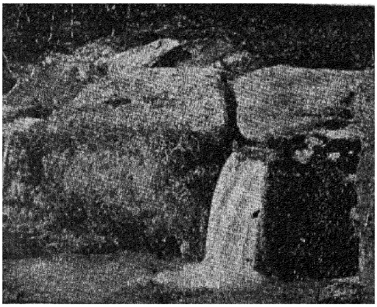

FIG. 113.—SOURCE OF A RIVER A SPRING.

The *Course* of a river, from its source to its mouth, where it flows into the sea, may be divided into three stages, *upper*, *middle*, and *lower*. If we look down a river with our backs to the source and our faces towards the mouth, the bank on the right is the *right* bank and that on the left, the *left* bank. The *tributaries* of a river are the smaller rivers flowing into it; they are also called *affluents*. The Jumna is an affluent of the Ganges. The spot where one large river joins another is called their *confluence*, *e.g.* the confluence of the Jumna and the Ganges is at Allahabad. The country drained by a river and its tributaries is its *basin*, a tract of land which slopes down towards the river in every direction. The rising ground dividing two river basins is termed a *watershed*.

The *work* done by the running water of rivers is of three kinds. They are: *Erosion* or the wearing away of the banks and beds of rivers; *Transport* or the carrying down of earth, stones, and rock which have been eroded; and *Deposition* or the dropping of the material eroded and transported, on their own beds, or on the land around them (when in flood), or into a lake or into the sea.

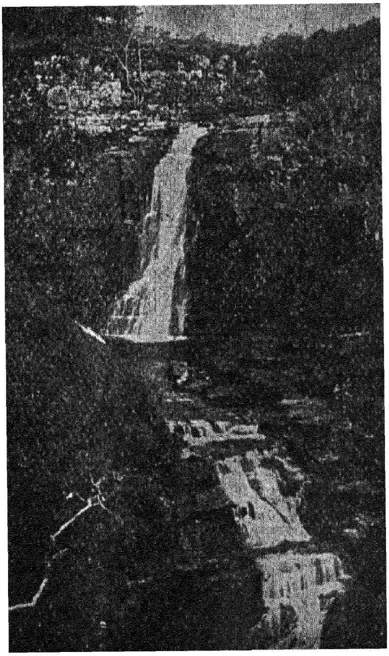

FIG. 114.—A TORRENT.

The first part of the *Upper Course* of a river, sometimes called the "*Torrential Track*," is usually down the steep slope of a hill, often a mountain side. Here the brook changes into a torrent, as in Fig. 114. If it rise in a lofty mountain range, as the Himalayan rivers do, *e.g.* the Indus and the Ganges, this part of its course is often a series of *Waterfalls*, where the water falls from one ledge of rock to another. When the water rolls rapidly over a long slope, the fall is known as a *Rapid*, or *Rapids*. Several falls, one after another, as in Fig. 114, are called a *Cascade*. The rate at which a torrent flows is about 20 miles an hour.

The next stage in the upper course of a river is often called the *Valley Track*. Here the river rushes down through a valley, over the more gentle slope that lies along the base of a mountain range, at the rate of 3 or 4 miles an hour. It carries down with it rocks, stones, and earth. The larger rocks and stones are broken into smaller pieces as they knock against one another and rub against the stony bed of the stream, and are worn down into smooth pebbles and rounded gravel. As it rushes onwards, the water wears away the sides of the mountain valley or gorge through which it flows, and makes it wider and wider. The hardest rocks, in the course of ages, yield to this erosion or eating away of their surfaces by running water. Owing to the steepness of the bed and the swiftness of the flow of the stream, very little material is deposited on the bed of a river in its upper course.

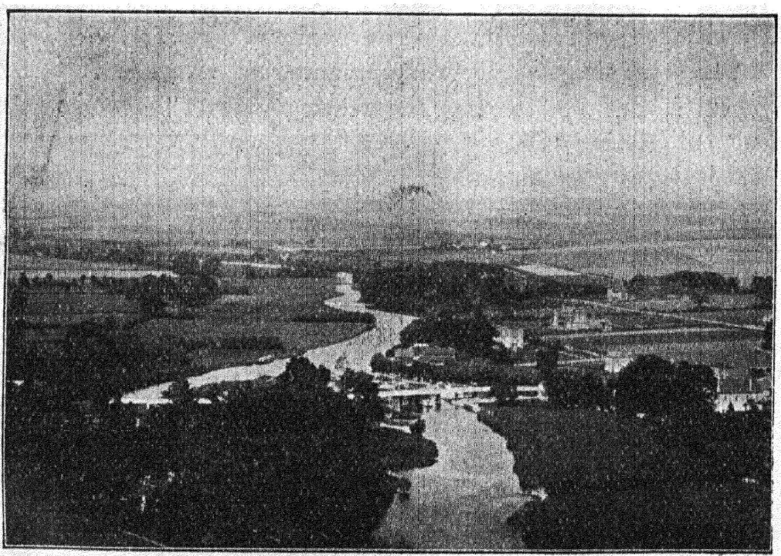

Photo. H. Taunt & Co.

FIG. 115.—MIDDLE COURSE OF A RIVER. THE THAMES AT STREATLEY HILL.

It is nearly all transported to the lower level. Because of the force of the rushing water the upper course is never navigable.

The *Middle Course* of a river is over a plain, and is sometimes termed the *Plain Track.* Here the water spreads the material that it has brought down from the upper course over the surrounding country and forms plains. The plain was once a river valley, but the sides of the valley have been weathered down by the wind, the rain, and the running water, acting through a long period of, say, 100,000 years or more. The bed of the river has been raised by the earth and the stones brought down from the hills in the distance. In time of flood, when the rain has been very heavy, or when the melting snow has filled the river to overflowing, the mud and soil transported from the hills have been spread all over the country, forming a "flood-plain." This soil is called *silt* or *alluvium*, and a valley like this is an alluvial valley.

The course of a river is never straight like the line of a canal. The stream always flows along the lowest ground it can find, and winds in and out to avoid any rising ground that may be in the way. A very winding river is said to *meander*, like the ancient river Meander in Asia Minor.

Change of Course.—Sometimes such vast quantities of silt are brought down by a river that the bed is raised up to the level of the banks. Then the river rushes away to the lower ground below one bank or the other and forms a new channel—many miles away, it may be, from its first channel. This often happens with the Indus and the Brahmaputra. The Hoangho, in China, broke its banks in 1852, flooded the country, and at last flowed into the Gulf of Pe-chi-li, 300 miles away from its former mouth in the Yellow Sea.

The *Lower Course* of a river is its last stage before it flows into the sea. In the upper course the slope is steep and its flow rapid. Very little sediment is dropped. Where the river enters the plains, the slope is much less, the flow is slower, and a great deal of silt is deposited both in the bed of the river and over the country around it. The volume of water in the river is increased by the tributary streams that join it and bring down fresh silt with them. In its third and final stage the slope is a plain nearly flat. There must be a slight slope or the water would cease to flow. It is often called a *Pene-plain*, a term which means "almost a plain," as the term peninsula means "almost an island." As the river meets the sea, its flow is checked, and it drops the silt, the earth, and the mud that it has brought down with it into the sea, close to the land.

If the mouth of the river is in a land-locked bay, the layers of earth deposited one above another, year after year, for thousands of years, form a bank that rises above the surface, and the river divides into two streams, one on each side of the bank. A new bank is formed in the same way, and the river again divides as in Fig. 116. More silt is washed up on the sides of the banks, and at length firm land is built up. The land formed in this way is called a *delta*. The first land to be called a delta was that at the mouth of the River Nile in Egypt. It is a great triangle, like the Greek letter delta, Δ, and received its name for that reason.

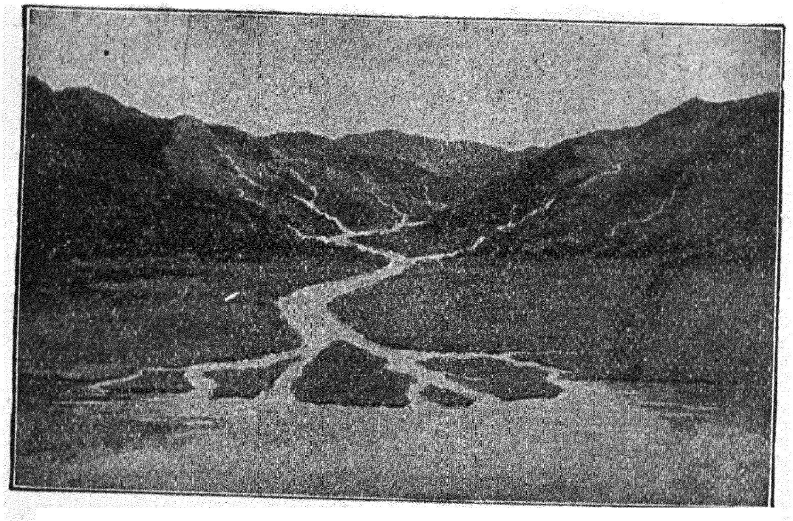

FIG. 116.—MOUTH OF A RIVER—DELTA.

Ages ago the Nile flowed into the Mediterranean Sea, at the point where Cairo now stands. The country between Cairo and the sea, a distance of 100 miles, is made of the alluvium that has been gradually deposited by the river. The length of the outside of the delta, or the coast between the dotted lines, is about 200 miles, and the depth of the alluvial soil is quite 120 feet. All this enormous mass of soil has been brought down by the Nile from Upper Egypt. Well may Egypt be called the "gift of the Nile." All Lower Bengal is, for a similar reason, the gift of the Ganges.

In this way great rivers build up large tracts of country at their mouths. The coast-line at the mouth of many great rivers bulges out into the sea. This may be seen in the physical map of India, at the mouths of the Irrawaddy, the Kistna, the Godaveri, and the Mahanadi. All the broad rice-fields of Bengal have been formed out of the mud and silt which have been deposited by the Ganges in the sea which once covered them.

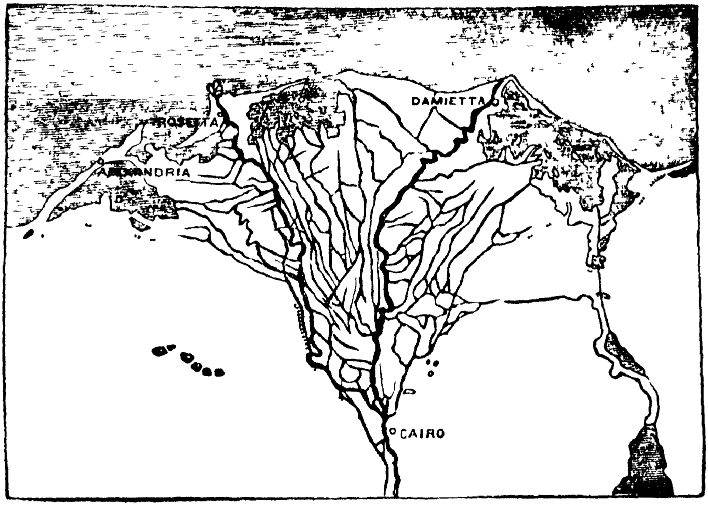

FIG 117 —DELTA OF THE NILE.

Glaciers, Rivers of Ice.—Above the snow-line the snow never melts. On the summits and higher slopes of lofty mountain ranges snow collects in great heaps above this line. The upper layers press down the lower layers into a huge solid mass of ice, which slowly moves down the mountain slope as a "glacier" (so called from the Latin *glacies*, ice). This "river of ice," however, does not flow down the mountain side like a river of water. A torrent of water rushes down at the rate of about 20 miles an hour, a river in the plains flows along at the rate of about a mile and a quarter in the same time; but a glacier only moves a few feet, often only a few inches, in a day. The glacier moves downwards till it gets below the snow-line, to a point where the air is warm enough to melt it. Then a stream of muddy water flows from it and is the source of a river. The Indus, the Ganges, and nearly all the Himalayan rivers are fed by snow in this way.

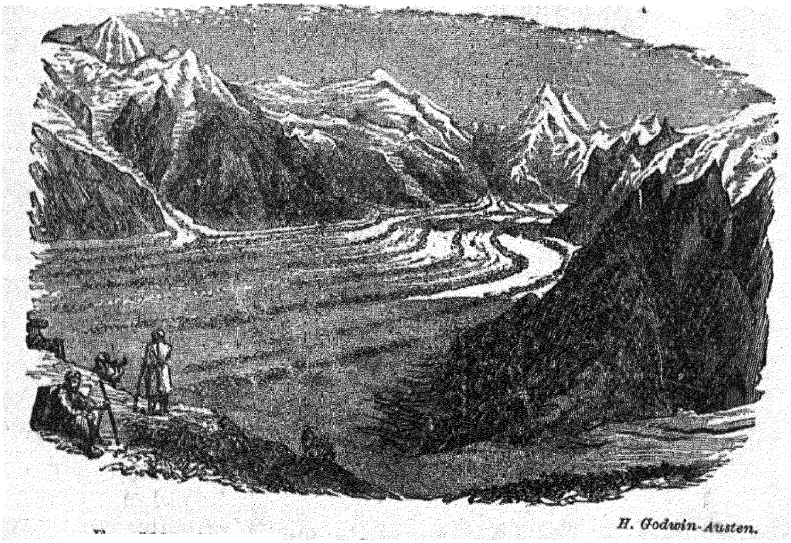
H. Godwin-Austen.

FIG. 118.—GREAT BALTORO GLACIER, KARAKORUM MOUNTAINS.

Fig. 118 is that of a magnificent glacier in the Karakorum range to the north of the Himalayas. It is 36 miles long, the longest in the world. On the left rises the lofty snowy peak known as Karakorum, 28,278 feet high. The Ganges rises in the glacier of Gangotri, the Jumna in that of Jumnotri. The hotter the season, the more the snows melt and the fuller the rivers get. When the rainfall of the monsoon is added to the water from the snows on the hills, there are floods in the river, which often overflows its banks and causes much loss of life and property. The stones and gravel which have fallen into the snow sink to the bottom and are left as long lines called *moraines.* In Fig. 118 they are clearly seen. From the vast glaciers which move down, in Polar regions, to the ocean, huge masses of ice break off and float away to the south as icebergs, some of them 200 feet high. The banks off the coast of Newfoundland are supposed to have been formed by the earth and stones which drop into the sea when the icebergs slowly melt in the warmer water of the Gulf Stream.

47. VALLEYS AND PLAINS.

OLD AND YOUNG.

THE first river valleys were the channels cut by running water in the surface of the old igneous rocky crust of the earth. Like mountains, valleys may be old or middle-aged or young.

These three stages in the life of a valley—youth, middle age, old age—correspond with the three stages in the course of a river—upper, middle, lower—for valleys are made by rivers. As soon as a stream ceases to be a torrent racing down a steep mountain side, its upper course is along a valley which it carves out for itself, it may be on a lofty plateau or it may be through cliffs which lead down to a plain below. This is a young valley.

The growth of river valleys in a plateau may be seen in Fig. 119, which shows how a valley gets wider and deeper from age to age. The line along the top is the surface of the plateau as it was when the river began to flow over it. The line at the bottom shows the level of the same land when it has been worn down by the river flowing over it for thousands and thousands of years. It is now a low-lying plain. All the land which once lay above it has been carried away by the river and deposited in the distant ocean, into which the river flows.

The V-shaped cut AA′ shows the first valley formed. The sides are steep. This is a new-born valley. No water is shown in Fig. 119, but you must imagine that a swift stream is flowing along the bottom of the V. Thousands of years afterwards, the shape of the valley is the deeper and wider cut going down between B and B′. This is a young valley. The wide stretch from C to C′ is the same valley in middle age, where the sides have widened still more and the bed is deeper. The space from D to D′ is an old valley, very wide and deep. The line E to E′ is a still older valley, which now looks like a plain. It is called a pene-plain. The line FF′ is the base level to which the plateau has been worn down. It is a plain.

All this time the rain and wind and the carbonic acid in the air have been busy. As the river has been deepening its bed at the bottom of the valley they have been wearing down the sides, eroding the rocks, which have gradually crumbled and fallen into the river below and been carried away by the running water. The river is like a man digging away at the bottom; the wind and the rain are like men digging away at the sides. Between them, working through long ages, and never stopping work for an instant, they remove the whole of the great block of land.

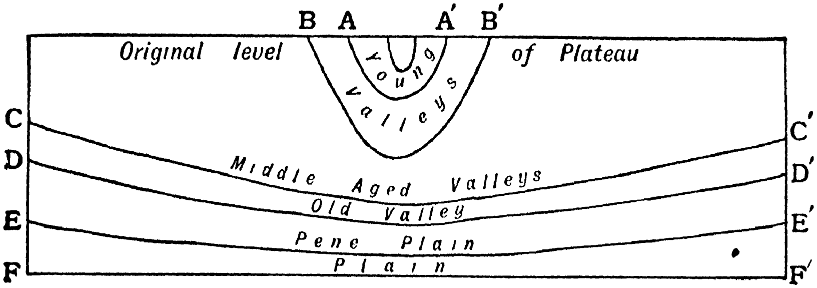

Fig. 119.—Growth of Valleys.

The same stages in the life of a valley may be seen in the following pictures.

A very new valley in its earliest stage is a mere mountain gorge like that in Fig. 120, through which a river has forced its way. It is deep and narrow, and the sides are still steep cliffs. It will take ages for these cliffs to wear down and for the valley to widen out. But the end is certain though it is still in the distant future. These cliffs will be worn down to the ground and the valley will become a plain.

In a middle-aged valley, like that in Fig. 121, the once lofty mountains have weathered down into low hills; their steep and jagged peaks and sides have been worn smooth by the "agents of denudation," the wind and the rain. The river, which has made the valley, has lost its supply of water as the hills have become lower and lower. It is now a narrow stream, winding along over the alluvial soil which, in ages long gone by, it brought down from the mountains. These hills will in course of time disappear, as they have vanished from the valley in Fig. 122, and the valley will become a plain.

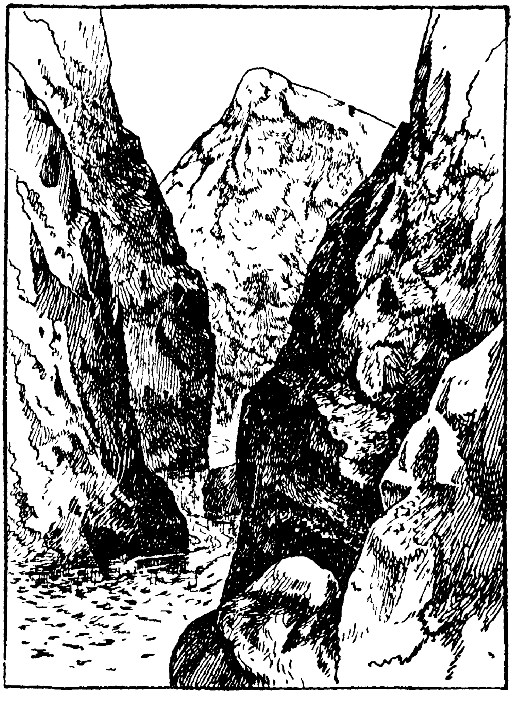

FIG. 120—A MOUNTAIN GORGE.

The oldest valleys are those which are the flattest, for the sides of the valley have been quite worn away by the weather. The very hills have disappeared, and with them the rivers in which they took their rise, and the valley in its old age has become a plain. An old river valley is often filled, to the depth of hundreds of feet, by *alluvium*, washed down by the river and its tributaries from distant hills. The great plain of northern India is an alluvial valley filled with the soil brought

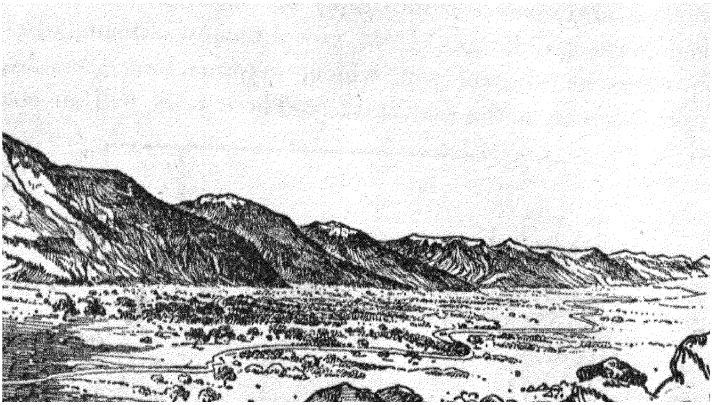

FIG. 121.—A MIDDLE-AGED VALLEY.

down into it by the Ganges from the Himalayas on the north and the Chambal and other rivers from the Vindhyas on the south

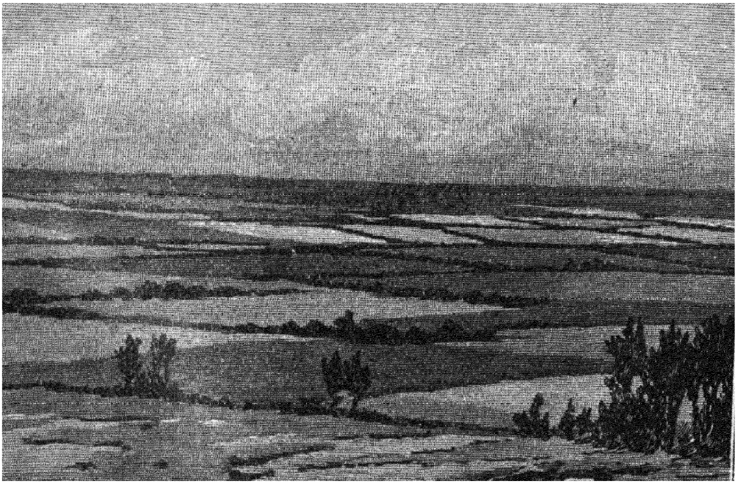

FIG. 122.—A VERY OLD VALLEY, NOW A PLAIN.

Great Plains of the World.—The great flat lands on the surface of the earth have been formed in different ways. Some of them lie at a low level, and to them the term *plain* is usually applied. Some lie at a high level, and they are called *table-lands* or *plateaus*. The surface of a plateau is not so level as that of a low-lying plain. Hills often rise across it or around it, or on the side of it.

When the rocky crust of the earth was cooling down from a liquid into a solid, great flat blocks were slowly upheaved as the surface rose, or were left standing as the tracts around them sank. The vast plains in the north of Europe and Asia were probably formed in this way. So were the wide plateaus of Central Asia and Tibet. They are *upheaved plains*. The latter rises 13,000 feet above the level of the sea between two mighty mountain ranges, the Kuen-Lun and the Himalaya.

Some of the plateaus made of softer rock than the rest were "dissected," worn down, and converted into river valleys by the action of running water, and these valleys were slowly changed into pene-plains, or plains, in the way already described. They are *River-plains*.

The *Coastal plains* that lie along the coast of many countries, *e.g.* India, were made by·the sediment brought down to the sea by large rivers and hundreds of small streams and deposited there. The flat banks thus formed gradually rose to the surface, and formed a long plain at the base of the hills along the coast. Other coastal plains have been made by "marine erosion," *i.e.* by the wearing away of the coast by the ceaseless action of surf upon it. The waves of the ocean beat upon their shores with great force and form a beach which is often miles wide.

In North America, vast plains stretch from the Rocky Mountains on the west to the Alleghany and Appalachian Mountains on the east (see map, No 11). On it there are many ridges of low hills and lines of valleys, but it is, as a rule, level. It includes the enormous pene-plains called *Prairies*, now watered by the Mississippi and its tributaries. They are so flat that the rivers are navigable for a distance of about 4000 miles from the sea. In South America (see map, No. 13) there are the vast plains or *Llanos* of the Orinoco, the *Selvas* or forest plains in the basin of the Amazon, and the *Pampas* in the basin of the La Plata. More than half of Europe is one immense plain, which sweeps across the north of France, Germany, Belgium, Holland, and Russia. It extends into Asia and forms the great northern plain of Siberia in that continent, a tract from 1000 to 1800 miles broad and about 4000 miles long. Round the Caspian Sea the plain is known as the *Steppes*, and in the north of Siberia as the *Tundras*, which extend downwards from the Arctic Ocean for 400 or 500 miles. It is so cold that not even grass grows·, the surface of the earth is covered with moss. China and northern India are wide alluvial river-plains.

The African continent is made up of table-lands, from which ranges of mountains rise. In northern Africa there is a wide barren region known as the *Sahara*. It is a long, broad plain, rising here and there into hills and low table-lands It is covered with dry shifting sand where little or no rain ever falls. It is one of the great deserts of the world.

Australia is, for the most part, a table-land in the west and a wide arid plain in the centre.

48. THE ATMOSPHERE.

What Air is.

Above the surface of the earth, over land and over sea, there lies an ocean of gas and vapour, though we cannot see it. It is called the *Atmosphere* or vapour-sphere—the *Air*, which is the "region of clouds, rain, snow, hail, lightning, thunder, breezes, storms and tempests." We live at the bottom of this ocean of air, as fishes live in the ocean of water, and we should die if we were taken out of it, as fishes die out of water.

As the earth cooled down from the gaseous into the liquid state, the air was formed by the mixture of two of the elements, Nitrogen and Oxygen, both of them gases. About four-fifths of the air is nitrogen and one-fifth is oxygen. The oxygen in the air supports life and heat, but we could not breathe pure oxygen. It is, so to speak, too strong and active. Nitrogen dilutes or weakens it and so makes it fit for us to breathe. Without oxygen we could not live. Without oxygen nothing would burn. These two gases make air But in the air, and mixed with it, there are other things as well, although we cannot see them. The most important of them are dust, water-vapour, and carbonic acid gas.

The Dust in the Air.—There are immense numbers of tiny solid particles in the air, but they are so small that they are usually invisible. Sometimes indeed there are so many that we can see them, and we say "the air is full of dust." But even in what seems to be the clearest and purest air, there are millions of particles of dust. They may sometimes be seen if a beam of sunshine shoots across a dark room through a hole in the shutter. Where does all this dust come from?

It comes from the earth and it comes from the sky. As the soil crumbles away, the finer dust is carried upward by currents of air and spread all over the earth and the sea, so that the air is full of it. Immense quantities are ejected by volcanoes. And dust comes also from the "shooting stars" or *meteorites* in the sky. They fall on the earth in great numbers by day and by night, though we can only see such as fall by night. These meteorites are pieces of rock of all sizes, scattered in vast numbers through space, and may be perhaps fragments of a planet that has burst into pieces. They speed along in a wide band through space, but when they come within the pull of the earth's attraction they rush into our atmosphere. There the friction or resistance of the air breaks them up into fine dust. They get white hot and appear to us as a tail of light that fades as soon as it is seen. It is believed that not less than 20 millions of these meteorites reach the air every day. Their dust is called *cosmic* or world-dust, to distinguish it from earth-dust.

The dust in the air over the sea settles down upon the water, sinks slowly through it, and at last reaches the bottom as sediment, and is pressed into solid rock. It is the dust in the air which gives the sky its blue and its brilliant tints at sunrise and sunset, by reflecting and softening the sunlight which shines through it. Without it, the sky would look black and the stars would be seen by day as well as by night. It causes the twilight in northern latitudes, by reflecting the light of the sun in front of it before it rises and behind it after it has set. The farther we go to the north or to the south, the longer the twilight. In these latitudes, *e.g.* in England, it is quite light in the morning long before sunrise and in the evening long after the sun has set. Fig. 123, in which the atmosphere is represented by the light shading all round the earth, shows that the rays of the sun, the "slanting rays" as they are called, have a much greater thickness of air to travel through at sunrise and at sunset than the direct rays at noon. This is why we can look at the sun for some time after it has risen and for some time before it sets, without blinking, while at noon it would blind us to look at it. Fig. 123 shows also the greater thickness of the air which the slanting rays have to pierce in northern and southern latitudes than the direct rays which fall on the earth within the Tropics.

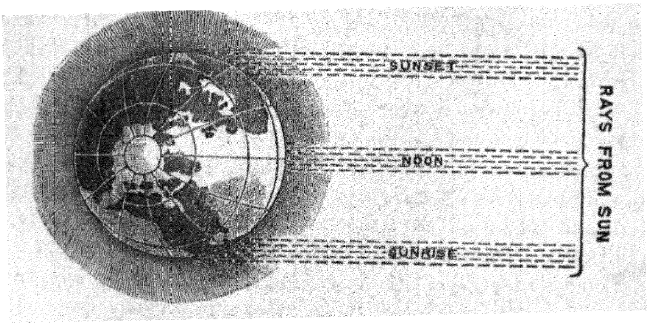

FIG 123.—RAYS OF THE SUN THROUGH THE ATMOSPHERE

Without the dust in the air there would be no rain, no mists or clouds or snow or dew All these forms of water are made by the condensing of the water-vapour in the air upon the invisible particles of dust.

Carbonic Acid Gas is a combination of the two elements carbon and oxygen. Carbon is a solid of which there is a great deal everywhere. Coal is nearly pure carbon, and so is black-lead. A large part of the bodies of animals and of the substance of plants is carbon. When they burn or decay, and when animals breathe, the carbon in them unites with the oxygen in the air to form carbonic acid gas. When a fire burns, the black smoke that rises into the air and mixes with it is carbon dust. The carbon in carbonic acid gas is the food of all plants. They take it in from the air through their leaves in sunlight and it becomes a part of them. When they die or decay the carbon passes into the air again. In this way carbon is always passing in and out of plants and animals Without it they could not live. The quantity in the air is small compared with the air itself, being only about 3 parts in every 10,000 parts of air. Yet it is enough to support the grass, the crops, the plants, and all the vast forests of the world.

Water-vapour is water in the state of a gas. Whenever water is heated, steam or water-vapour rises from it into the air. We cannot see it, but it is always rising and the air is full of it. As the sun shines on the ocean, on rivers and on lakes, water is always "evaporating," *i.e.* rising into the air as vapour. It rises because it is lighter than air.

The carbonic acid gas and water-vapour in the air keep the earth warm, as a blanket keeps a man's body warm. The rays of the sun heat the air as they pass through it but they heat the ground much more. Not more than about one-third of the heat is absorbed by the air as the downward rays pass through it. The heat which reaches the ground is radiated back by the ground into the lower layers of the air resting on it, and this heat is much greater than the heat they received from the downward rays. Carbonic acid gas and water-vapour are both bad "conductors" of heat. Heat does not pass through them easily. They keep back the heat of the earth just as glass does. In a green-house or glass-house in which plants are put to keep them warm, the air is much warmer than it is outside. The bright hot rays of the sun pass through the glass and heat the plants and the floor inside, but the glass keeps back the rays of heat and prevents them from escaping into the air. If there were one-third less carbonic acid gas than there now is in the air, the earth would be covered with ice, for its heat would escape into the upper regions of the air.[1] The clouds and the water-vapour in the air help to keep the earth warm too. The air on a cloudy night is often much warmer than it is on a bright clear night. The blanket of cloud keeps in the heat.

49. THE ATMOSPHERE (*continued*).

PRESSURE OF THE AIR. HOW IT IS MEASURED.

Weight of the Air.—We cannot see the air, nor do we feel it except when it moves. We do not think of it as heavy. We say "as light as air." All gases are light compared with liquids or solids. Yet the air has weight. It has been weighed. *At the sea-level* 13 cubic feet of air weigh one pound.

How high the atmosphere is we do not exactly know, but there are reasons for thinking that the air rises upwards to a height of from 100 to 200 miles. It is not, however, equally dense the whole way up. The upper air presses down the lower air, so that it is densest close to the earth. The higher the air the lighter it is.

The weight or pressure of the whole atmosphere at the sea-level is 15 lbs. on every square inch of surface under it. It presses downwards with this weight. But the air is a *fluid*,[2] and like all fluids it presses equally in all directions—upwards, downwards, and sideways. This is why we do not feel it pressing upon our bodies. Our bodies, too, are full of air, and this air presses outwards against the air pressing inwards so that we do not feel it.

The Mercurial Barometer.—The weight or pressure of the air is measured by the *Barometer*,[1] in which air is weighed against mercury. The common barometer is a glass tube about 33 inches high, closed at one end so that no air can get in, and open at the other. It is filled with mercury, on which the air presses at the open end Here we have two columns, one of air and the other of mercury. The column of air, a very light gas, is invisible, but we know that it goes right up to the upper limit of the atmosphere, say 100 miles high. On the other hand the column of mercury, which is a very heavy liquid, is less than 3 feet high. The two columns balance one another, as two equal weights do in a pan of scales. At the level of the sea, it is found that the air presses on the surface of the mercury at the open end with force enough to hold up the mercury in the tube at the height of 30 inches. If it were not for the weight of the column of air the mercury would, of course, run out of the tube But the air presses the mercury downwards, and the mercury at the open end "communicates," or passes on, this pressure upwards to the column in the tube and thus keeps it up 30 inches.

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[1] *Physiography*, by Huxley and Gregory, 1912, p. 88.

[2] *Fluid*, from the Latin *fluo*, flow. The term fluid includes liquids, gases, and vapours, for the particles of all three flow freely over one another, while the particles of solids do not move.

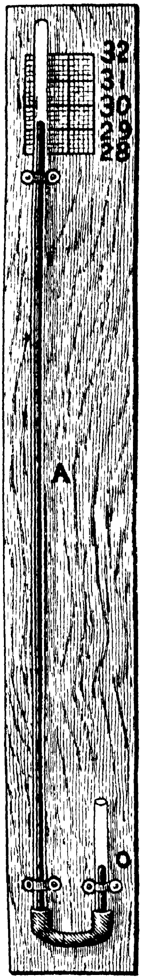

FIG 124. MERCURIAL BAROMETER.

You must notice that this is the pressure of the air in ordinary weather *at the level of the sea*, where the atmosphere is highest and its full weight is felt. If you take the barometer up a hill or in a balloon, there is less air above it, and the mercury in the tube will fall lower, because the pressure of the air is less than it was at the sea-level. The barometer, therefore, shows us the height of any place, where it stands, and the pressure of the air at that place. If the air be dense and heavy the pressure is said to be *high*. The mercury keeps high in the tube. If the mercury falls, it shows us that, for some reason or other, the air above it has become lighter and rarer; the pressure is then said to be *low*.

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[1] *Baro-meter*, from the Greek *baros*, weight, and *metron*, a measure. It is so called because it measures the weight of the air.

The barometer is only 33 inches in height, because the mercury can never rise up to that height. Why do we use mercury? Because mercury is heavy and we need only have a barometer of this height, 33 inches. We might weigh the air against water, but a barometer of this sort would be 34 feet high, for water is about 13½ times less dense than mercury, and a barometer of this size would be inconvenient to use.

The rate at which the mercury falls is, roughly, about 1 inch for every 900 feet as we ascend. Mont Blanc, the highest peak in the Alps, is about 3 miles high. There the barometer falls to about 15 inches from 30 at the sea-level. The pressure of the atmosphere, *i.e.* the weight of the air, is about one-half what it was at sea-level, and the density is also about one-half, *i.e.* a cubic foot of air, which at the sea-level weighs 1¼ ounces, weighs only ⅝ of an ounce at the top of Mont Blanc.

One-half of the whole mass of the air lies below the height of 3½ miles, *i.e.* about 18,500 feet. Another rise of 3½ miles to 7 miles leaves half of this half, *i.e.* three-quarters of the whole below and one-quarter above. The weight of this is equal to 7½ inches of mercury. At the height of 21 miles the mercury in a barometer would stand at 1 inch high.

50. THE ATMOSPHERE (*continued*).

TEMPERATURE.

Temperature.—The temperature of the air has a good deal to do with climate, for it is the main cause of the winds which make lands warm or cold by blowing over them, and of the rain which the winds bring with them. The term "temperature" means state or condition of hotness or coldness. Hot air is said to be at a high temperature and cold air at a low temperature.

How Temperature is measured.—The temperature of the air is measured by the *Thermometer*, which shows how hot or how cold the air all round it is. In the thermometer mercury is used, as well as in the barometer. In the latter, the rise or fall of the mercury shows us the pressure of the air ; in the former, the rise or fall of the mercury, as it expands or contracts, shows us the temperature of the air. All bodies, we know, expand or grow larger as they are heated, and contract or grow smaller as they cool, whether they be solid, liquid, or gaseous. Mercury, being a liquid, expands and contracts easily, and this is one reason why it is used.

Thermometers.—To enable us to see the changes in temperature

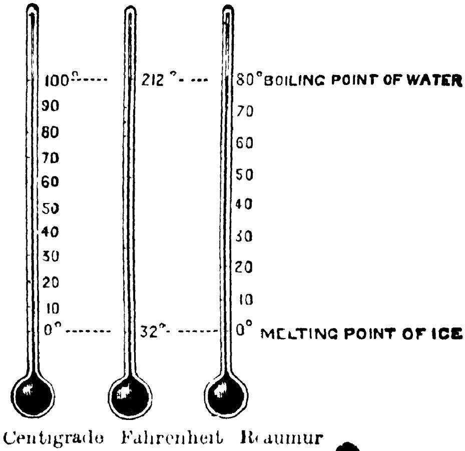

FIG 125 —THERMOMETERS

marked by the rise or fall of the mercury, a "scale" of figures is marked on the side of the glass tube. In Fig. 125 we see three kinds of thermometers. They are all alike except in the scale.

The thermometer is a tube of thick glass called the *stem*, opening downwards into a ball of very thin glass called the *bulb*. No air can get inside, as the top end is sealed. There is nothing inside but mercury. The heat of the air outside goes through the thin glass of the bulb and heats the mercury in it. As the mercury gets hot, it rises in the tube and may be seen through the glass, rising in the stem. If the air cools, the mercury inside the stem also cools and falls.

The thermometer in the middle is the one usually used in England because it was the only one known for a long time. It is called the *Fahrenheit*, after the man who invented it. In it the temperature at which water freezes, or, which is the same thing, the melting-point of ice, is marked 32°. The temperature at which water boils is marked 212°. The space between the two is divided into 180 degrees (not shown in the Figure in the book) The *Centigrade* or hundred-degrees thermometer is also used in England by men of science. In it the melting-point of ice is marked 0° and the boiling-point of water is marked 100°. The *Réaumur* thermometer is used in Germany and Russia. In it the boiling-point of water is marked 80°.

The figures marked on the scale of a thermometer are used to describe the temperature of the air anywhere. If we want to describe the temperature, or in other words, to say how hot it is, in Calcutta, or Bombay, or Madras, on any day, we do so by saying the temperature is 90°, or 80°, or 60°, as the case may be. Any one in any part of the world will know what this means exactly. So if you should read that the temperature in London on some day in winter was 32°, you know exactly how cold it was on that day

How Changes in Temperature are caused —The air and the earth are heated in three ways—by radiation, conduction, and convection.

Radiation.—The sun is the source of all the heat in the air. Its bright hot rays heat the air as they come down through it, and heat the air again, a second time, as they are radiated back into it from the earth as dark hot rays. These dark rays heat the air much more than the bright rays. The direct rays of the sun heat the air and the earth more than the oblique or slanting rays as we saw in Lesson 6. The zones of sun-heat, in Fig. 16, show that the temperature is highest (at the sea-level) in the Tropics, and lowest in the Polar regions. *Temperature depends*, therefore, in the first place and mainly, *on latitude.*

Conduction.—Heat passes from one body to another when the bodies do not move, but touch each other. Solids are better conductors of heat than liquids, for their particles are closer to one another, and liquids are better conductors than gases, whose particles are still further apart. The denser a body is the more easily heat passes through it For this reason land is a better conductor of heat than water. It heats more quickly and cools more quickly. Heat passes into it and out of it rapidly.

The surface of the land when heated by the sun warms the layer of air resting on it by conduction. This heat is spread through the upper layers by convection

Convection—The lower layer of air resting on the earth when heated expands, becomes lighter than the air above it, and rises through it. The upper layers, being colder and heavier, sink down to the ground, and are heated, and rise in their turn. There is thus an upward current of air and the whole mass of air is warmed. This passing upwards and downwards of the air is termed "convection."

Liquids are heated in the same way. When water is heated from *beneath*, *e g* when it is boiled in a pot over a fire, the lower layer is heated first and rises, and the colder and heavier upper layer of water sinks through it to the bottom, is heated and rises in its turn, till all the water in the vessel is heated. This is convection.

But when water is heated from *above*, *e.g.* as the water in the sea is heated by the rays of the sun, the upper layer, being warm, cannot sink, for it is lighter than the colder layers under it. It does not move, neither do the lower layers move. But the heat passes slowly from the upper layer to the lower by conduction.

Heat, it is clear, cannot pass by convection through a solid body like land, for its particles are fixed and cannot go up and down when heated as those of air and water do. There are currents of air and currents of water, but there are no currents of land. The sea heats very slowly under the sun's rays, and cools just as slowly. The land heats rapidly, and cools rapidly. The unequal heating and cooling of the land and sea is the cause of the winds, as we shall see.

51. ISOTHERMS.

HEAT EQUATOR.

THE zones of sun-light and sun-heat in Fig. 16 divide the surface of the earth into broad spaces, according to the temperature of the layer of air close to the surface, due to the heat of the sun's rays as they strike it. The direct rays are hotter than the oblique or slanting rays, and therefore the temperature of the air in the Tropics is higher than that in the Temperate zones, and the temperature in these zones is higher than that in the Frigid zones.

It is the temperature of the air above a place that makes it feel hot or cold. If this temperature were due only to the bright rays as they reach it from the sun, then the latitude of a place would give us its temperature. We should know at once that a place 10° north of the Equator would be hotter than another place 15° north, and so on. But most of the heat in the air is not due to these bright rays, but to dark heat rays which are radiated back into it from the surface of the earth. This heat varies according to the nature of the surface. If it were all sea, or all land on one level, and if the land were all rock of one kind, covered with soil of the same sort, then, indeed, the radiation would be the same everywhere and the heat would vary exactly with latitude. But three-quarters of the surface of the earth is sea and one-quarter land, and the land lies on different levels. It may be a high plateau or a low-lying plain, it may include lofty mountains or low hills, it may be covered with green grass or thick forests, or it may be a dry and sandy desert.

Also the rocky crust of the earth which makes up the surface of the land, either in solid blocks or crumbled into soil, is made up of many different kinds of rock which absorb and radiate heat differently, some of them being better conductors of heat than others. And land absorbs and radiates heat much faster than water does

We must remember, too, that even the heat of the bright rays of the sun is not always greatest at that part of the

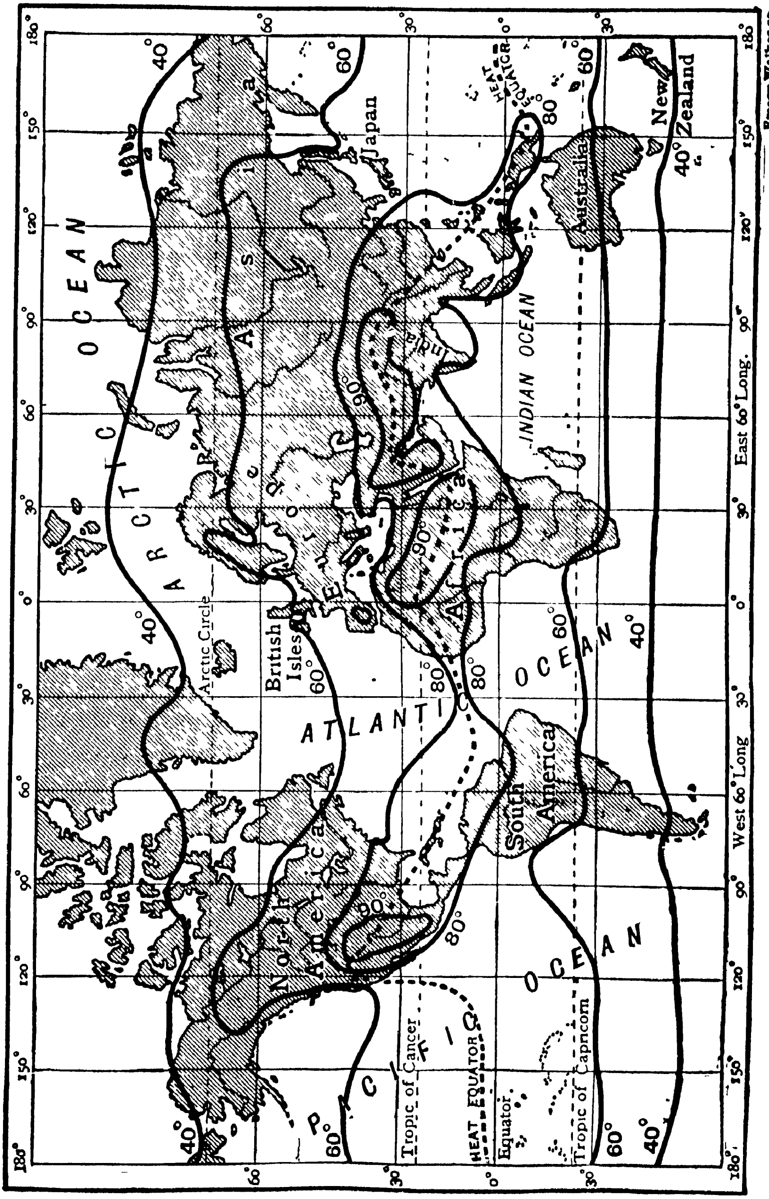

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FIG. 126.—MEAN JULY ISOTHERMS OF THE WORLD.

surface of the earth directly under the Equator. As we saw in Lesson 6, the line of greatest heat keeps changing as the earth moves in its orbit round the sun. It is sometimes north of the Equator and sometimes south of it. Like a parallel of latitude, it is an imaginary line going right round the earth, and it changes every hour and every moment, moving northwards as the North Pole of the axis of the earth inclines towards the sun, and southwards as the South Pole inclines towards the sun. It follows the "swing" of the axis of the earth, or, as it appears to us who are on the earth, the "swing of the sun." With it the temperature marked by the Tropics and the Warm Temperate zones moves also, north and south of the Equator. This line of heat is not the same as the Thermal Equator described later on in this lesson. It is fixed solely by the heat of the bright rays as they penetrate the air, while the Thermal Equator is fixed by the dark rays radiated by the earth into the air.

In summer, in the northern hemisphere, the tropical heat moves northwards into the Warm Temperate zone, the warmth of this zone moves up into the Cool Temperate zone, the coolness from this zone takes the place of the cold zone above it, and the coldness of the Frigid zone lessens as the Arctic Circle comes within the rays of the sun.

As, in summer, warmth moves upwards, so in winter, in the same northern hemisphere, cold and coolness spread downwards. The coldness of the Frigid zone goes far southwards into the Temperate zone, and the coolness of this zone moves downwards into the warm zone, and in the Tropics it is warm rather than hot along its northern border.

The temperature of the air at any place does not depend altogether on its latitude. In other words, the temperature at two or more places having the same latitude is not always the same, even when they are at the level of the sea. For instance, London and Irkutsk (in Siberia) are both in very much the same latitude, viz 50° N. Yet the mean annual temperature in London (by the thermometer) is 50°, while at Irkutsk it is 39°. New York and Lisbon and Pekin are all three in N. latitude 40°. But the temperature is 51° in New York, 53° in Pekin, and 60° in Lisbon.

These differences in temperature between places having the same latitude are explained clearly by *Isotherms*. What are isotherms?

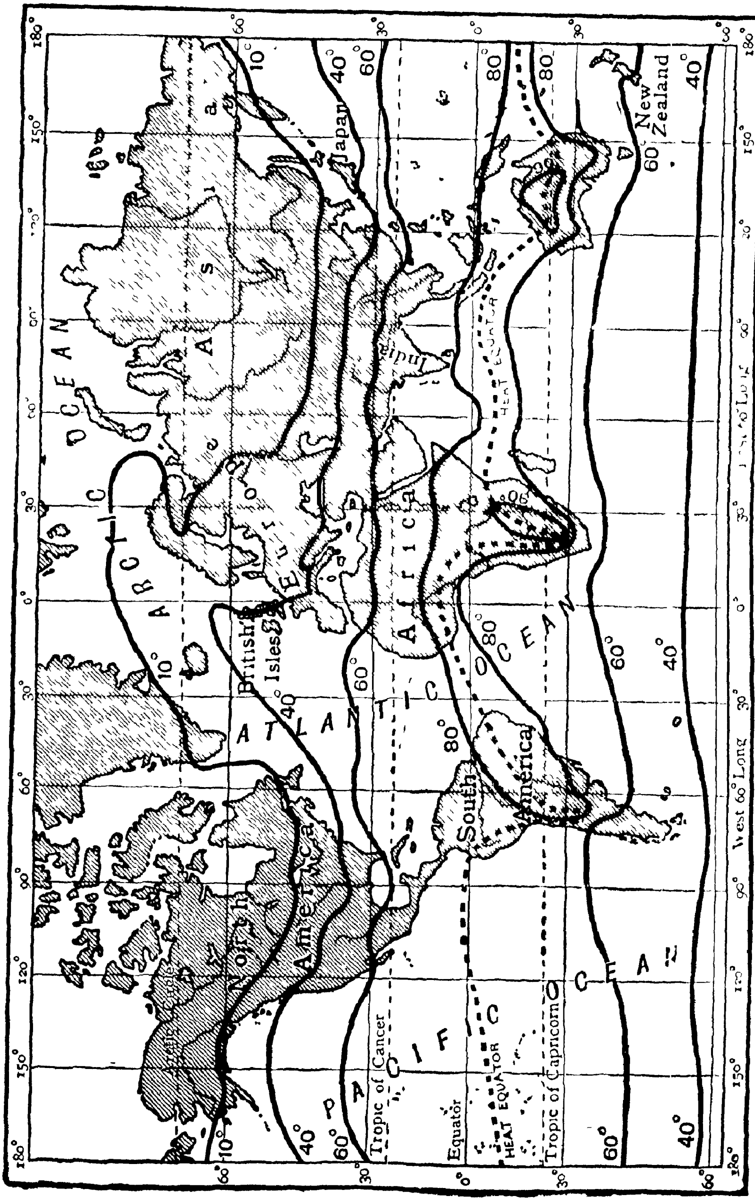

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FIG. 127.—MEAN JANUARY ISOTHERMS OF THE WORLD.

In describing the "temperature" at any place we should notice three things, viz. the highest annual temperature, the lowest temperature, and (between these) the average or mean temperature, *i.e.* what the greatest heat in the year is, what the least heat is, and what the average heat is. The difference between the highest and lowest is called the *range* of the temperature.

If the temperature of the air for every hour of the day and night be registered, and the figures added together and divided by 24, we shall get the average or mean temperature for that day. If the mean daily temperatures for the whole year be added together and the total divided by 365, we shall get the *mean annual temperature.* This is done regularly in many stations all over the world.

If, then, we draw a line on a map through the names of all places having the same mean annual temperature, we shall have a line of equal temperatures. A line like this is called an *Isotherm.*[1] But as a map like this would be very crowded with names, it is usual to omit the names and leave the lines only as is done in Figs. 126 and 127.

We know that temperature on land decreases with altitude; in other words, the air grows colder as we go higher. Therefore a true isotherm would go up and down, with many turns and twists, as it followed the heights. It would come down southwards on the map from a place in Iceland to any place high up on the Himalayas. It would be very difficult to read such a map. It is usual, therefore, to show upon isotherm maps the temperatures on land *at the sea-level* only. They are really temperatures for " imaginary flat countries without hills." Over the sea, isotherms show actual temperatures.

In other words, in these maps the actual temperature of a place is reduced to the sea-level temperature. We know that the temperature as tested by the thermometer falls about one degree for every 300 feet of height. **Quito** is a town on the Equator in South America. It is 9000 feet above the sea. This height gives it a temperature 30 degrees lower than it would have if it were at the sea-level. If the isotherm of 80°

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[1] Greek *isos*, equal, *therme*, heat.

pass through it, we understand that its actual mean temperature is 80° - 30° = 50°.

The most important isotherms are those which show the mean temperatures for January and July, the coldest and the hottest months, for they give us the *range* between the highest and lowest temperatures. Fig 127 is a map of the mean January isotherms of the world, and Fig 126 a map of the mean July isotherms. The thick line in the middle of both maps is the Thermal or Heat Equator. Fig 128 is a map of the mean annual isotherms, and the thick line in the middle is the mean annual Heat Equator.

These isotherms should be studied very carefully, because they show us very clearly how and why temperature changes. They show us why and when the air above any country is hot or cold. They help us, therefore, to understand what makes the climate of a country , for, as we shall see, climate depends very much upon the temperature of the air.

We see, for example, how *temperature changes with the seasons.* Look at the two maps in Figs. 126 and 127. Follow with your eye the highest isotherm on both maps. At all the places along this line the thermometer stands at 40° in July, *i.e.* in summer. But where is this 40° isotherm in the map for January, *i e.* in winter? It is not where it was? Why not? Instead of it, we see an isotherm marked 10°. At all the places on this line the temperature has fallen at least from 40° in July to 10° in January, *i.e.* by 30°. But in many countries the temperature has fallen much lower than this. See where the summer or July isotherm of 40° runs in North America and in the great continent of Eurasia, including Europe and Asia. It is in the far north of these countries. Through the centre of the same countries runs another isotherm marked 80°. The temperature marked 10° on the isotherm in January has come down to the centre, *i.e.* it has fallen from 80° in many places in July to 10° in January, *i.e.* by about 70°. In all these places the air was very cold in January and very hot in July.

The isotherms also show us how *temperature depends on latitude.* At the same season of the year the temperature in high latitudes is always lower than it is in low latitudes. The farther north or south we go from the Heat Equator, the cooler the air gets, both in summer and in winter.

Again, we see that in *winter the temperature is higher over the sea than over the land.* Look at the January isotherms. Here it is winter in the northern hemisphere. The isotherms all rise over the sea, showing that it is warm there, and bend southwards over the land showing coldness. Follow isotherm 10°. It bends far to the south over the land in North America, but as soon as it comes to the Atlantic Ocean it runs up northwards and goes still more to the north in the Arctic Ocean, but again bends southwards over the land of Europe and Asia.

In summer the temperature is higher over the land than over the sea. Look at the July isotherms. Here it is summer in the northern hemisphere. The isotherms in that hemisphere now rise over the land, showing how hot the air is there. They bend southwards over the sea. Look at the isotherm 60°. It runs up northwards in North America and Eurasia, but sinks over the Pacific and Atlantic Oceans. The isotherm 40°, it is true, rises a little in the western part of the Arctic Ocean. This is due to the warm westerly winds which blow at this season of the year in that region.

We see, too, that places in the middle of the land, in the centre of the great continents, are very hot in summer and very cold in winter. The temperature is said to be continental. On the other hand, in places close to the sea, particularly in islands which are surrounded by the sea, the air is cool in summer and warm in winter; the temperature is maritime, *i.e.* like that of the sea.

The range of temperature, from heat to cold and from cold to heat, is shown very markedly by the isotherms. This range affects climate very much. A place where it is very hot at one time of the year and very cold at another time is not a pleasant place to live in. Over the sea the isotherms do not run up and down nearly so much as they do on land. We saw before that if the surface of the earth were all sea the temperature would be the same along the same line of latitude. Look now at isotherm

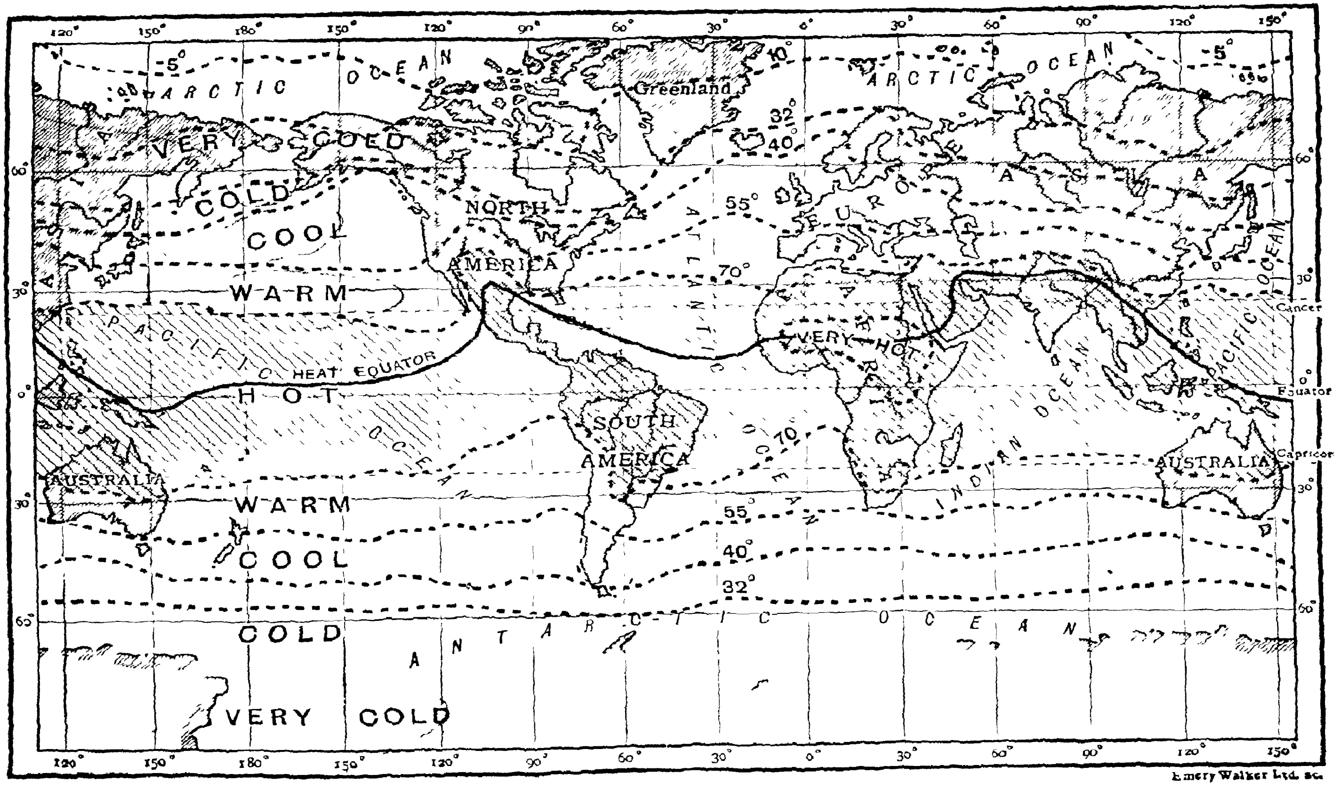

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FIG. 128.—MEAN ANNUAL ISOTHERMS AND HEAT EQUATOR.

40° in both maps. It passes over scarcely any land and therefore it is almost a straight line like a parallel of latitude. It is a great contrast to the isotherms which pass partly over the sea and partly over the land, *e.g.* isotherm 60° in July and 10° in January.

And these isotherms show us one or two things more about the temperature of the air. There is a greater range from heat to cold and back again from cold to heat in the north Temperate zone than anywhere else. See how the isotherms in this zone run up and down with the seasons. This is because there is more land here than anywhere else. Between the Tropics, in the Torrid zone, there is no such violent change. It is always hot. Look at isotherm 60° in the map for January. It bends up and down very little. On the whole, too, there is less change in the southern hemisphere than in the northern, because it has more sea than land.

The Thermal or *Heat Equator* is shown by the thick dotted line in the middle of each of the three maps. It is a line drawn through the places above which the heat of the air is greatest, in other words, through the hottest places within the Tropics. The heat is the heat radiated into the air by the hot dark rays from the earth. The heat above this line is much greater than that of the line of heat, described in Lesson 6, which marks the greatest heat from the bright rays. The Thermal Equator moves up and down as the isotherms do, although it is not itself an isotherm.

52. THE ATMOSPHERE (*continued*).

THE WATER IN THE AIR.

WATER is a liquid, but when it is heated it becomes a gas which is called water-vapour. The vapour which rises from boiling water is steam. Steam, when it is pure and not condensed, is invisible. We cannot see steam or water-vapour any more than we can see air. But when the vapour rises into the air, some of it condenses when it touches the invisible dust in the air, and then we can see it. A speck of earth-dust, however tiny, is a solid, and is colder than a particle of water-vapour. When the latter touches the former it becomes cold too, and condenses, or rests on it as a liquid. The condensed vapour takes different forms and shapes, known as cloud, mist, and fog. When still further condensed it becomes liquid, and even solid, and falls back on the earth as rain, hail, and snow.

Clouds.—So long as the rising vapour is close to the heated ground, we cannot see it. But as it rises higher into the cooler air it condenses, and is seen in the shape of clouds. A cloud is held up by the air underneath it. It may seem strange that a cloud can float in the air. If you hold a small book in your hand, and let it go, it will fall at once to the ground. Tear out all the pages and let them go separately. Each of them will fall to the ground, but very slowly. Tear a page into tiny bits and let them go. These bits of paper will flutter about and fall still more slowly. The air holds them up. If you could tear each bit of paper into a million of tiny particles, so fine that you could not even see them, they would not fall for a very long time. They would float about in the air. So it is with the water-dust in the air.

Rain.—The hotter the air the higher it rises, carrying up the water-vapour in it. The air is never still. It is always moving up or down or sideways. The water-vapour in it is carried about with it. It rises high above the earth whenever it is over a heated part of the surface. As it reaches the cooler upper currents of air, it condenses a little and a cloud is seen. The cloud may meet with a colder current of air. It is chilled, and condenses still more into drops; the cloud becomes darker and darker as the drops get larger. At length they are so large that the air cannot hold them any longer, and they fall to the earth as *rain.* The whiter a cloud is, the colder the air is in which it is floating. The very white clouds, far up in the sky, are made of ice-dust, for the air up there is cold enough to freeze water, and must be below the temperature of 32°.

Mist and Fog.—The ground is often very cold late at night or early in the morning, when it has radiated most of its heat into the air. If there be much water-vapour in the air above the cold surface, it condenses over the ground and is called *Mist* or *Fog*. A mist is a light fog, and both mist and fog are merely clouds resting on the cold ground. A cloud is a fog high up in the air. Mountains and hills are often covered with mist, for currents of warm air rushing up their slopes are chilled when they reach the colder air always found on the heights of mountains. Thick yellow or brown fogs are often seen in large towns like London and Calcutta. The dirty colour is due to clouds of smoke which fill the air from the factory chimneys. Heavy fogs sometimes rise over large rivers or over the sea. On the Brahmaputra the fog is often so thick that river-steamers have to stop for hours. Off the coast of Newfoundland in North America there are banks in the sea dreaded by sailors, because of the thick heavy fogs which hang over them and hide from view the icebergs which come down from the north. Many ships and steamers have been wrecked here. The fogs are caused by the meeting of a current of warm water called the Gulf Stream and a current of cold water known as the Labrador Current. Over the warm current the air is full of warm vapour. It is chilled when it meets the cold air over the cold current, and condenses into fog.

Dew and Frost.—At night, if the sky should be clear and free from clouds, which, as we saw in Lesson 48, keep in the heat of the earth like a blanket, the ground, and the grass upon it, give off into the air the heat which they took in while the sun was shining, and get cold. By morning the air above the grass gets cold also and contracts. When it does this it cannot hold so much water-vapour as it did before; the moisture is squeezed out and deposited on the grass in drops of water, which is *Dew*. The warmer the air is the more vapour it can hold; the colder it is, the less it can hold, for the particles come closer together. When, at any temperature, it can hold no more vapour, the air is said to be *saturated* or full. If it be cooled below this point dew is deposited. The highest temperature at which dew forms is called *Dew-point*. Sometimes when the temperature is below 32° in the air close to the ground, the dew is deposited in a solid form as frozen vapour, and is called *Frost* or *Hoar-frost*, *i.e.* White frost.

Ice is water in a solid state. Water freezes or changes into ice at the temperature of 32°, which is called the freezing-point. Nearly every liquid becomes smaller in bulk, or volume, or size, when it changes into a solid. But water and one or two other liquids actually occupy more space as solids than liquids, so that the solid weighs less than the liquid. This may be seen by putting a piece of ice into water in which it does not sink but floats. Ice weighs about nine-tenths of an equal volume of water. It floats in fresh water, with about one-tenth of its bulk above the water. *Icebergs* are huge masses of ice, often hundreds of feet high, which are formed in the Polar seas, where the temperature is always far below 32°. They float down to lower latitudes, chilling the air above them.

Hail and Sleet.—Rain falling in drops from a great height is often frozen, as it falls, by passing through a very cold layer of air. The frozen drops are called *Hailstones* They are much larger and heavier than the ice-dust of snow. *Sleet* is half-melted snow which has fallen through a warm layer of air.

Snow.—In the higher regions of the air, where it is intensely cold, the water-vapour is frozen into tiny pieces of ice. They are much smaller than drops of rain, so small that they may be called ice-dust. This is *Snow.* It falls to the earth and covers the ground like a white sheet. In hot countries the snow is changed into rain as it falls through the lower layers of warm air, but in cold countries it keeps its form and falls softly and noiselessly to the earth looking like white feathers, called snow-flakes, floating down from the sky It may fall for hours or even days together and lie in a sheet many feet thick.

Snow-Line.—There is a height in the air, whether over land or sea, at which the temperature falls to 32° and never rises above it Above this height snow and ice never melt. The height varies according to latitude, for the air gets colder and colder as we go from the Equator towards the Poles. It varies according to the season of the year, for in the same latitude the air is colder in winter than in summer. On land also it varies according to the height of the land, for the air is colder on hills and mountains than at the sea-level, although the latitude may be the same. A line drawn through the air, over land and sea, marking the limit above which water-vapour must condense into ice, and below which it condenses into water, would be a *snow-line*. In Fig. 129 the height of the snow-line on various mountains from the North Polar Sea to Equatorial Africa is shown. The Alps rise through the snow-line at about 9000 feet. Above this height, there is perpetual snow on the Alps. On the great volcanic mount of Kilimanjaro in

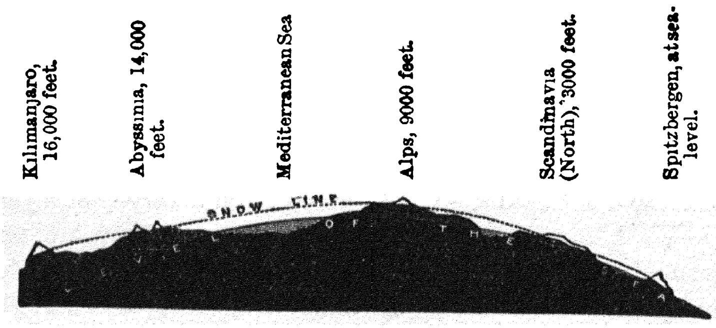
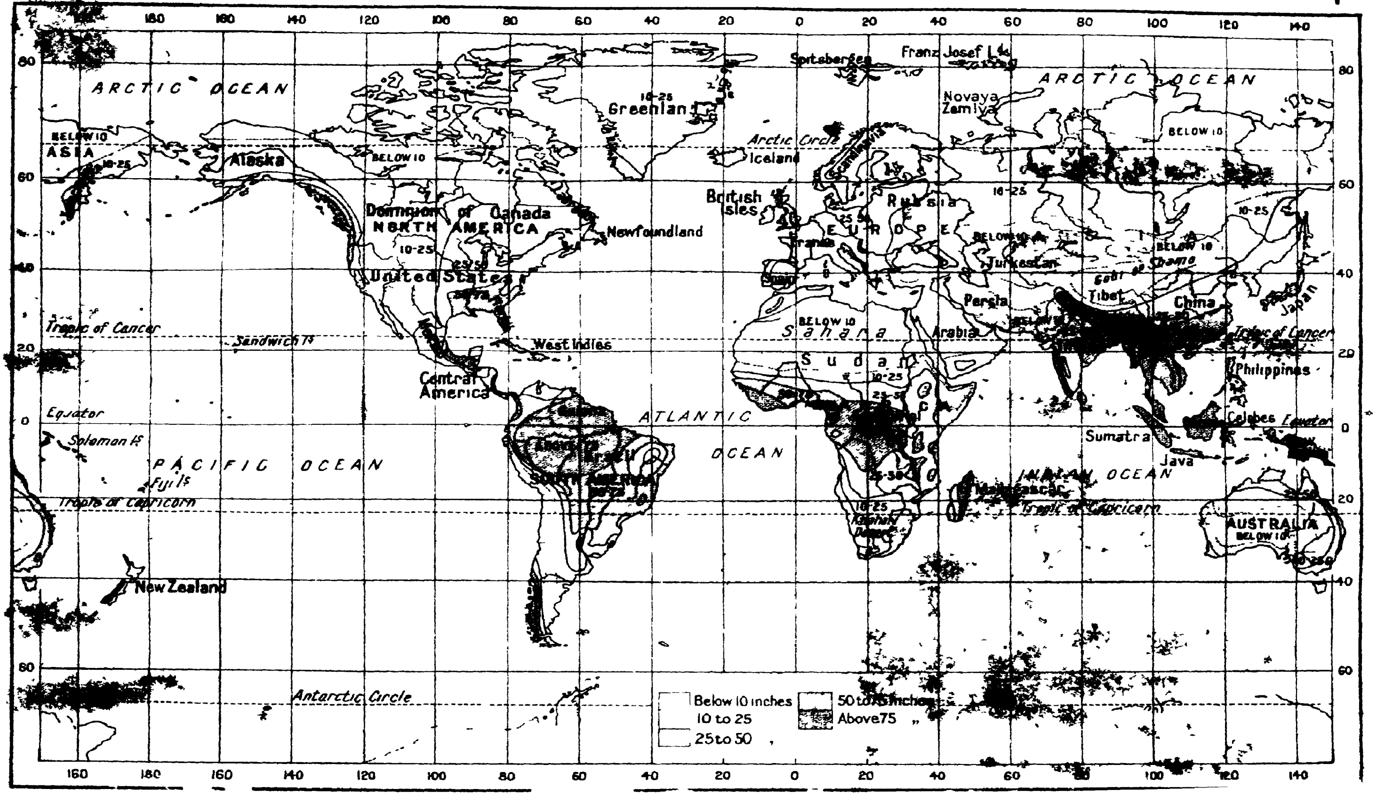

Kilimanjaro, 16,000 feet.
Abyssinia, 14,000 feet.
Mediterranean Sea
Alps, 9000 feet.
Scandinavia (North), 3000 feet.
Spitzbergen, at sea-level.
SNOW LINE
OF THE

FIG. 129 —POSITION AND HEIGHT OF THE SNOW-LINE BETWEEN EQUATORIAL AFRICA AND THE NORTH POLAR SEAS.

East Africa the snow-line runs at 16,000 feet. The Himalayas stand in one of the hottest regions of the earth, but they are so lofty that their summits are covered with snow that never melts. On the north side of this lofty range, which lies open to the hot dry air from the heated plateau of Tibet, the snow-line is about 16,600 feet high, but on the south or Indian side the line descends 4000 feet lower. In the Andes of Peru the snow-line is at about 15,500 feet.

It will be seen that in Fig. 129 the height of the dotted snow-line rises higher and higher from the sea-level at Spitzbergen, an island in the Arctic Circle, to 16,000 feet on Kilimanjaro in the Tropics. It is like a mighty invisible arch through the air, the highest central point rising to the height of some 18,000 feet at the Equator, while the two ends of the arch come down to the

MEAN ANNUAL RAINFALL



ground at the Arctic and Antarctic Circles. A half of this arch is shown in Fig. 130. It is the same curved line that is seen in Fig. 129 but it is shown in a different way.

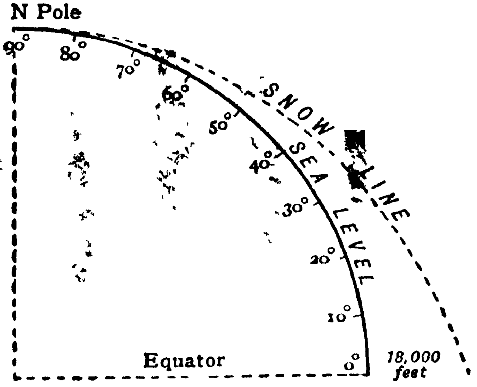


FIG. 130
THE SNOW-LINE IN DIFFERENT LATITUDES.

We must be careful to distinguish between the *snow-line* and the *freezing-point* of water. Above the snow-line there is *perpetual* snow. But the freezing-point—*i.e.* the temperature at which water freezes—is higher or lower up in the air, according to the season. In England, *e.g.*, this point in winter is often at the surface of the ground, and then the ponds and streams have a crust of ice on their surface and one can walk over them dry foot. There is a frost. But in summer this freezing-point is a mile and a half overhead at the snow-line.

53. RAINFALL OF THE WORLD.

RAIN, as we have seen, is condensed from the water-vapour in the air, and falls, by its weight, on the surface of the land and the sea. As it falls through the air it cleans and purifies it, washing out of it all dirt and dust. Every one has noticed how fresh and pleasant the air feels after a shower of rain.

In describing the climate of a place, we must always think of the rainfall. This is what makes climate moist or wet or dry, and renders soil fertile. How are we to compare the rainfall of one country with that of another? How is rainfall gauged or measured?

The Rain-gauge.—Rainfall is measured by a rain-gauge. It is a round metal funnel for catching the rain, usually 8 inches in diameter at the top, and it is placed inside another vessel to store the rain and prevent loss by evaporation. Close to it, in Fig. 131, there is also a glass measure, marked in inches on the side, into which the rain is poured. The gauge is placed in the open air so that rain may fall freely into it.

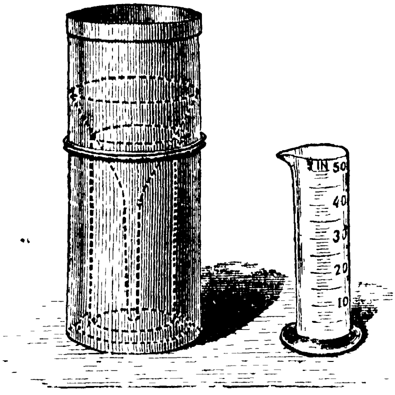


FIG. 131.—RAIN-GAUGE.

Once in 24 hours the rain that has fallen is measured and the amount put down on a register with the date. The rainfall for each month is found by adding up the daily totals, and the yearly rainfall by adding up the monthly totals. When we say that, within a certain time, an inch of rain has fallen anywhere, we mean that if all the rain that fell had remained on the ground without sinking into it, the ground would have been covered by water to the depth of 1 inch. If the rainfall for the whole year be 100 inches, we mean that the ground would have been covered by a sheet of water 8 feet 4 inches in depth.

As more rain often falls in one year than in another, it is usual, in describing the rainfall anywhere, to name the *average* rainfall of several years, say fifty And in describing the rainfall over a whole country, we take the rainfall of a good many stations all over the country, divide the total by the number of stations taken, and then put down the *mean* annual rainfall.

The coloured Map 1 gives the mean annual *rainfall* of the world. The rainfall is marked in colours, as shown in the scale in the map. The countries marked in light yellow, as having less than 10 inches of rainfall, are all of them *deserts*; the *hot* deserts of the world lie in the Tropics or close to them, and the *cold* deserts in the Arctic regions. The amount of rainfall in each region of rainfall is given in figures. Thus the mean annual rainfall on the Himalayas is *above* 75 inches.

The heaviest rainfall is in the Tropics, the hottest part of the world, where the great heat causes enormous evaporation. This, indeed, is known as the "zone of constant rain." The rainfall decreases gradually northwards and southwards as the temperature of the air decreases towards the Poles This is the general rule, but this rule is changed in many places by the arrangement of land and sea and by the winds.

There is more evaporation over the sea than over the land, because of the greater extent of water. On the other hand, as the air is colder at night over the land, condensation is more active there. For this reason there is a heavier fall of rain over the land than over the sea, and there is, on the whole, a greater fall of rain in the northern hemisphere than in the southern, because there is more land in that hemisphere.

The condensation of vapour and the fall of rain is heaviest near the coast-line of a country washed by the ocean. In many countries, *e g.* in the Deccan in India, the west coast is very rainy, while the interior is very dry The clouds brought by the westerly winds rush up the slopes of the Western Ghats into the cool air on the summits of the Ghats. There the rain falls, and very little is left for the land on the other side of these mountains. In the British Isles the rainfall is heaviest along the western coast When the prevailing wind is easterly the east coast gets the rain, *e g* in S.E. Africa.

A mountainous country has a heavier rainfall than one in the plains. This is because the air is cold and condenses the vapour that passes over it into rain.

Lands lying in the interior of a continent, far from the ocean, have, as a rule, very little rain. There is a great rainless tract of deserts that stretches from North Africa, where it is known as the Sahara, across Arabia, Persia, Baluchistan, far into Central Asia, where it is called the Gobi or Shamo. In this arid tract the soil is dry and sandy. It becomes intensely hot under the blazing sun. The hot dry air rises, but the winds which blow in to take its place cannot deposit rain, even if there be moisture in them, for instead of being cooled they are driven upwards in the rising stream of hot air.

If we compare Map 1, showing the rainfall all over the world, with Map 2, showing the density of the population in the various countries of the world, we shall see that population depends largely on rainfall. Where the rainfall is abundant, and especially where it is moderate, there many people live, for there crops grow well. In a well-watered country the rivers which flow over the land and fertilise the soil are fed by the rainfall on the hills. On the other hand, where the rainfall is excessive and the land intensely hot, the country is unhealthy and few people live in it.

54. THE ATMOSPHERE (*continued*).

MOVEMENTS OF THE AIR. WINDS.

THE air is never at rest It is always in motion, rising or falling, or moving across from land to sea or from sea to land. It is, like water, a fluid, and, like water, it is always moving The air we cannot see, but water we can see, and it will help us to understand some of the movements of the air if we think of water.

If water be poured into a tub, it does not remain heaped up where it is poured in. It spreads all over the tub, and the surface always keeps at the same level. When a stream of water flows into a lake, the water in the lake is always rising, so as to keep the surface level. The ocean, too, does the same. Enormous quantities of water pour into it from countless rivers, and rain is always falling into it, yet the surface is always, more or less, at one level, which we term the sea-level.

The ocean of air above us behaves in somewhat the same way. If from any cause there is less air in any part of the atmosphere than in other parts, the air comes streaming into it from all sides to fill it up.

What causes these differences in the state of the atmosphere? Why should there ever be more air in one place than in another? Why should there be a higher column of air over one part of the earth's surface than over another?

We have already learned what causes these changes in previous lessons on the atmosphere, on temperature, and on the water-vapour or moisture in the air.

When water is heated from below it expands, becomes lighter than it was before, and rises, as in Fig. 132. There is a lamp burning below the vessel which is heating the water. The arrows pointing upwards show how the bottom layer of water is rising to the top. When it gets there it flows over on both sides and sinks to the bottom as the arrows pointing downwards show. Meanwhile another layer has taken its place and rises to the top after it. All liquids are heated in this way, *i.e.* by convection.

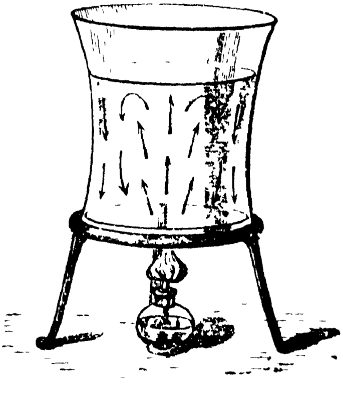


FIG 132 HEATED WATER RISES.

Air behaves very much in this way. The land, heated by the rays of the sun, heats the air over it, as the lamp heats the water over it The hot air expands, becomes lighter, and rises above the earth. As it does this the surrounding air rushes in to take its place, is heated, and rises too. Thus the column of air gets taller and taller. It is chilled when it rises very high and flows over on both sides *at the top of the column*, as the water does in Fig. 132.

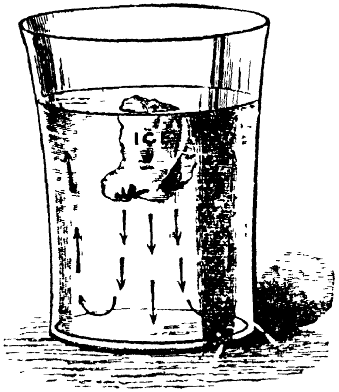


FIG. 133 —CHILLED WATER SINKS

That heated air rises may be seen by the smoke from any fire. We cannot see the air, but we can see the smoke which is carried up by the air. Smoke is merely coal or wood dust. Why should it rise? A handful of coal-dust falls straight to the ground. It is the air, heated by the fire, that rises, taking the coal-dust, *i.e.* the smoke, with it.

Fig. 133 shows us how cold water sinks. There is a lump of ice, floating in the water, which chills the layer of water below it. It gets heavier than the water underneath and sinks to the bottom of the vessel as the arrows pointing downwards show. Here it gets a little warmer, and is pushed away by another cold layer sinking on it. It flows away on both sides *at the bottom of the upper cold layer*, and rises up the sides of the vessel. This chilling of the water by falling and rising currents is also termed convection.

Very much in the same way air is chilled as it rises high above the earth by the coldness of the atmosphere above it It then gets heavier and sinks to the earth, pushing away the lighter air beneath it, which flows out on all sides of the heavy cold column *along the surface of the earth*, and then rises, so as to make the surface of the whole volume of air, as far as possible, level.

Light air rises, heavy air sinks. And water-vapour, as we know, is much lighter than pure air. Air which is *saturated*, *i.e.* *full* of water-vapour, is, therefore, much lighter than dry air, and rises. Heated air, which has expanded, can hold much more moisture in it than cold air, for cold air is denser, its particles are closer together, and there is less room for the particles of vapour in it.

If we bear all this in mind, we shall understand how, and why, and when *winds* blow. Wind is merely moving air. Air moving at the rate of about 7 miles an hour is called a light breeze. If its velocity, or rate of movement, be 25 miles an hour, it is a strong wind. A gale of wind blows at the rate of 50 miles an hour, and the velocity of a hurricane or tornado is about 80 miles an hour. If rain comes down with it, we call it a storm or tempest; if there be thunder and lightning as well, it is a thunderstorm.

A column of cold dry air, being heavy, *presses* heavily upon the surface of the earth. This pressure is called *high* pressure. Hot or warm dry air such as there is above a desert of sand in the Tropics is much lighter, and if it be filled with the vapour of water, as it always is when it is over the sea, it is lighter still. The pressure of a column of this air is much less than that of a column of equal height of the former, and it is termed *low* pressure.

In short, "high" pressure means heavy pressure and "low" pressure means light pressure. Of course a very low column of cold air does not weigh so much nor press so heavily on the earth as a very high column of hot air.

The great law of the winds is this. *Wind always blows from a region of high pressure to a region of low pressure.* It is always moving from a cold region to a warmer region.

The pressure of the air is always changing because the temperature is always changing, and, with these changes, the amount of moisture in the air is always changing too. This is why the wind so often changes. Some winds, however, are more or less *constant*, or permanent, others are *periodic*, or seasonal, *i.e.* they come at certain periods or seasons of the year, others, again, are variable or local. Different names were given to these winds by sailors in the old days when ships depended wholly on the wind

Land and Sea Breezes.—Every one who has lived on or near the seaside in India has felt these light winds and knows them well. In the daytime, especially in the hot season, the land gradually warms up under the sun's rays, and, by the afternoon, the air over the land streams upwards as a current of hot air. The cooler air over the sea blows gently inward over the land to take the place of the ascending hot air. It is a *sea-breeze.* Towards night it dies away, as the sun goes down, and the land cools. As the night wears away, the land rapidly radiates its heat into the air and becomes cooler than the sea, which has not parted with its heat so readily. Towards morning the air moves gently from over the cooler land to over the warmer sea. This is a *land-breeze.* The clearer the air and the less cloud there is, the greater the radiation and the stronger the breeze is.

Let us now consider the great winds of the world. Look at the zones of sun-heat in Fig. 16. Here we have a Hot zone at the Equator, then a Warm zone, then a Cool zone, and, lastly, a Cold zone. The air is cooler, and therefore denser and heavier in each zone, as we go northwards or southwards from the Equator.

In the Tropics, north and south of the Heat Equator, there is always a belt of heated air over land and sea. It is known (see Lesson 53) as the *Zone of Constant Rain.* Here a great current of hot air is always streaming upwards, carrying with it vast quantities of water-vapour, which rises from the heated seas.

As this stream of air and vapour reaches the upper region of the atmosphere, where it is very cold, the moisture condenses into rain and falls. This belt is a region of low pressure, for the air is saturated with water-vapour, which is very light. It is known as the *Belt of Equatorial Calms*, for the movement of the air is always *upward.* Very little wind blows *across* the land. The term "wind" is usually applied to horizontal currents of air over the surface of the land, not to vertical, *i.e.* upward or downward currents.

As the air in this Hot zone rises and flows away to the north and south, far above the earth, towards the Poles, the cooler denser air of the Warm zones north and south of it creeps along the surface of the earth underneath it to take its place. There are thus two currents of air flowing in two opposite directions, one very high up, going towards the Poles, the other, below it, flowing towards the Equator. The lower current is called the *North-east Trade Wind* in the Northern Hemisphere, and the *South-east Trade Wind* in the Southern Hemisphere.

The upper current is cooled as it moves Poleward. It grows heavier, and a large part of it sinks to the earth just north of the Tropic of Cancer and south of the Tropic of Capricorn, replacing the air that streamed along the surface of the earth towards the Equator There is therefore a great mass of moving air rising at the Equator, moving towards the Poles as an upper current, sinking to the ground at the Tropics of Cancer and Capricorn, and flowing back again to the Equator as a surface current. This is, on a very large scale, just like the convection currents of water that we saw in Figs. 132 and 133.

Winds are always named by the points of the compass *from* which they blow. Thus a north-east wind is one that blows from the N.E. (towards the S.W), a south-east wind blows from the S.E. (towards the N.W.).

These winds were called *Trades* by the old sailors, because they were very steady and helped them in their navigation.

The trade winds would blow straight from the north and south towards the Equator, if it were not for the rotation of the earth. The earth, with the air resting on it, is spinning, from west to east, with a velocity which is, at the Equator, over 1000 miles an hour. The velocity gets less and less towards the Poles, where it is *nil* (see Lesson 3, p. 9). The rate at which the air is spinning eastward depends, therefore, on its latitude. In the northern hemisphere the wind which is streaming southwards, towards the Equator, is acted on by two forces, and therefore it moves along the line which is known in physics as the *resultant* of the two forces, *i.e.* it moves in a line between them, just as the moon does in its orbit (see Lesson 7, Fig 22). The pressure on it, acting alone, would make it a northerly wind, and the rotation of the earth acting alone would make it a westerly wind. It actually blows as a north-easterly wind. For as it blows southwards, its west to east velocity gets less and less than that of the solid earth beneath, because it blows from places where the velocity of rotation is less. It keeps this relatively slow velocity and seems to lag behind the earth in its rapid rotation eastward. The effect of this is that as it nears the Equator it seems to blow from east to west, "just as a man travelling in a motor-car or aeroplane in the same direction as a wind blowing more slowly than he is moving, feels the air blowing in his face from the opposite direction." For exactly similar reasons, the wind blowing from the Tropic of Capricorn towards the Equator is a south-easterly wind. Forces like those just described act on all winds. For this reason there is scarcely ever a true northerly or southerly wind.

At the Poles, over the Arctic and Antarctic Oceans, there is a region of low pressure. This may seem strange, for the air there is intensely cold, and we know that cold air is heavy air. But although the air is cold there is not very much of it, that is to say, not so much as there is over other parts of the globe. The earth is spinning round with great velocity, and as we saw in Lesson 2 on the Rotation of the Earth, a globe of any material, solid or liquid or gas, will flatten at the Poles and bulge out in the middle if it be made to spin rapidly round on its axis. Fig 6 on p. 5 shows that the diameter of the earth at the Poles is less than at the Equator. A gas bulges out still more than a solid, for its particles are not held together so tightly. The height of the atmosphere, therefore, at the Poles, is less than that elsewhere, more particularly at the Equator

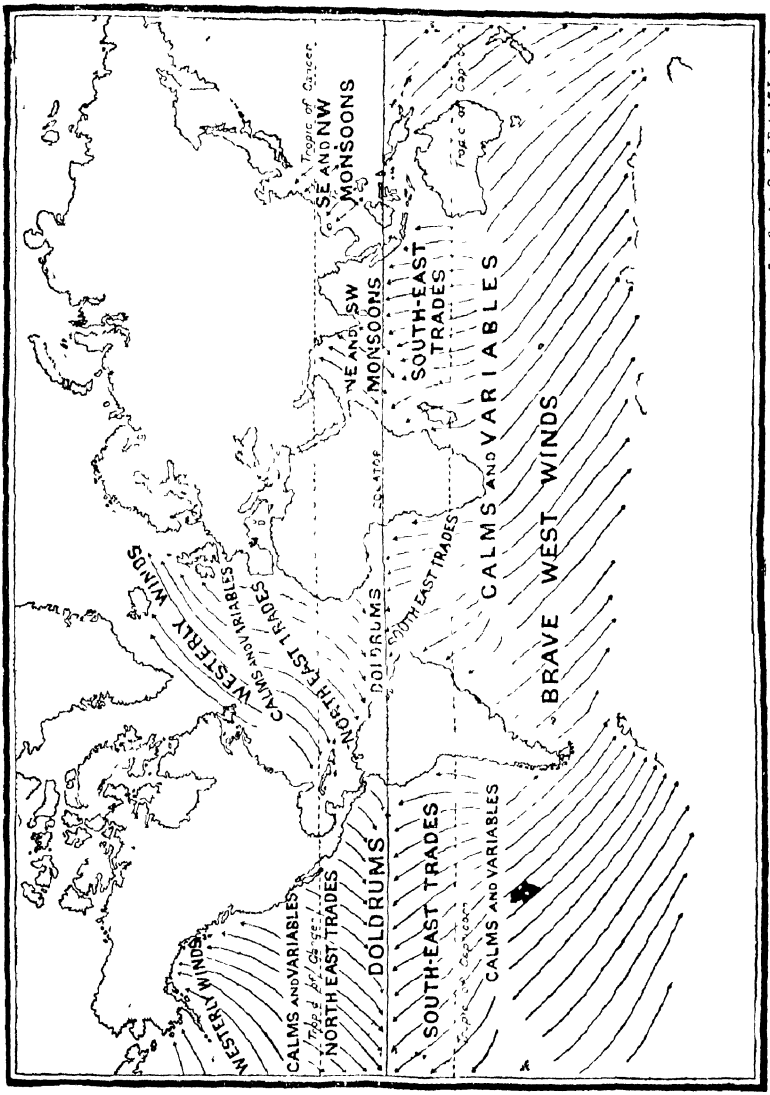
We have seen that a *part* of the great upward current of hot air at the Equator sinks to the earth in the warm zone The rest of it passes onwards to the Poles as an upper current, mingling with the current of warm air rising from the warm zone All this air is drawn towards the Poles by the low pressure there. The place of the warm air that rises from the warm zone is taken by cold surface currents that creep southward from the North Pole and northward from the South Pole These cold currents from the Polar seas are turned partly to the east by the rotation of the earth, and are changed into north-east winds in the northern and into south-east winds in the southern hemisphere.

Also, between the warm and the cool belts, there are south-westerly winds which are converted by the different pressures over the masses of land and the sea in those latitudes into westerly winds. In the southern hemisphere these westerly winds are called by sailors the *Brave West Winds* As they blow in about the latitude of 40° S. they also call them the *Roaring Forties*.

The main points to keep in mind, as regards these prevailing or constant winds of the world, are these :

1. Over the Equator and over the Poles there is low pressure.
2. Over the Tropics there is high pressure
3. From the high pressure regions the air blows outwards in two directions. There are north-east and south-east trade winds towards the Equator, and south-westerly and westerly winds towards the Poles.

Belts of Calms.—The belt of Equatorial calms is called by sailors the *Doldrums*. This is an old word meaning dulness and sadness. They applied it to this part of the ocean because here they were becalmed for weeks together. There are also two belts of calms over the Tropics known as the *Calms of Cancer* and *Capricorn* respectively. This is the great region of high pressure, and here the currents of air from the north and from the south meet, one from the north-east and the other from the south-west.



Stanford's Geog! Estab! London

Fig. 134.—Great Winds of the World

The movement of the air in these regions is upward from the earth and downward from the upper currents towards the earth, just as it is at the Equator. Where the westerly winds meet the Polar winds there are also two belts of calms called the *Polar Calms.*

Periodical or Seasonal Winds —These are also known as the *Monsoons.* They are caused by the unequal heating of land and sea, the land being the continent of Asia and the sea the Indian Ocean and the South Pacific. There are two monsoons because of the swing of the line of greatest heat (see Lesson 51) from north to south in summer and in winter. A south-west monsoon blows from the Indian Ocean over India from April to October. It brings a great deal of rain with it. A north-east monsoon blows from October to April from Central Asia over India. It comes chiefly from the land and is often called a dry monsoon, because it brings very little rain with it. Over China and the south-east of Asia the monsoons are from the north-west and the south-east.

Fig. 134 shows by arrows the direction of the great world-winds which have been described.

55. THE OCEAN AND ITS MOVEMENTS.

TIDES.

THOSE who live on the seashore observe that, *twice* every day, the sea comes forward on the land, if it be a low beach, and then goes backward to where it was before. If the coast be a steep cliff, the sea rises up the cliff a foot or two above sea-level and then sinks again to its former level. This movement of the sea, forwards and backwards, is very slow. Inch by inch the water creeps up for six hours, and inch by inch it goes back for the next six hours. But twice in the month the water rises higher than it does the rest of the month.

This rise and fall of the sea is known as the *Tides.* The forward movement is called the "flow" of the tide, and the backward movement is the "ebb." The times of these tides never vary. They are as regular as the rising of the sun and moon and may be foretold years beforehand. They are not caused by the wind. The tide flows on as usual even when the strongest gales blow in the opposite direction.

When the sea is advancing, it is a "flood tide," when it is retreating, we have the "ebb tide." These movements are also known as "high tides" and "low tides." The highest line on the beach reached by the incoming sea is called "high-water mark" The lowest line it reaches, when it retreats, is "low-water mark." The sloping part of the beach between the high-water and low-water marks is called the "foreshore."

Fig. 135 shows the high- and low-water marks very clearly. The edge of the sea is low-water mark. It is along the left of the picture. On the right, there is the foreshore, with the high-water mark. Higher up, there are the banks worn away, where the waves of the sea have beaten upon them in storms. A boat which floated in on the flowing tide has been left on the sand by the ebb of the tide.

On the foreshore it will be seen that there are two high-water marks, one above the other. Twice a month, high water is higher and low water is lower than usual. In other words the tide is stronger than usual and covers more of the shore. There is then what is called *Spring tide.* The other tide is the *Neap tide*, when the sea does not come so far up the land nor go back so far. It has always been seen that these tides follow the movement of the moon. At new moon and at full moon there are spring tides. In the first and last quarters of the moon there are neap tides. How are tides caused?

Fig. 136 explains the tides. There is the sun in the middle of the figure. The earth is shown at two points of its orbit round the sun. At the top of the Figure there is the moon at two points of its orbit round the earth—when it is full moon and new moon. At the bottom of the Figure, we have the moon at two other points of its orbit—when it is in the first and last quarter. With this Figure may be compared Fig. 23 (in Lesson 9), which shows the phases of the moon.

Both the sun and the moon attract the earth. They attract the globe of the earth and the ocean of water resting on it. The earth also attracts the water. There are thus three forces acting on the water. Attraction (see Lesson 7 on Gravity) acts between all bodies in proportion to their size and *inversely as the square of the distance* between them. The earth is close to the ocean which is touching it. Its attraction is the strongest of the three. The ocean cannot leave it. The attraction of the moon is the next strongest, for it is much closer to the ocean than the sun, although the sun is immensely larger. The force with which the sun attracts the ocean is not even a half of that of the moon.

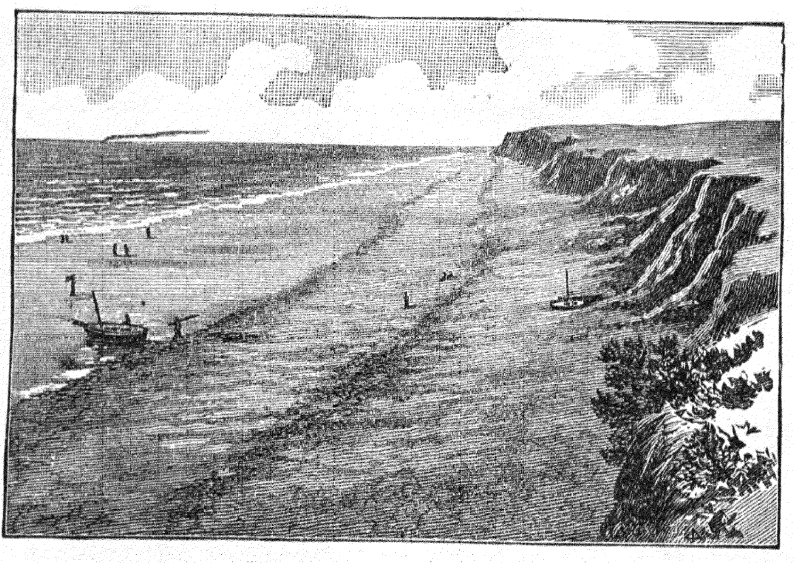


FIG 135 —HIGH AND LOW TIDES

Water, being a liquid, yields easily to the force of attraction. It cannot leave the earth, but it rises up towards the moon as it passes over it, and towards the sun as the rotation of the earth brings one part of the earth after another directly opposite the sun.

The moon attracts both the globe of the earth and the ocean on it. That part of the ocean opposite to the moon is nearer to it than the earth is. The water is pulled up towards the moon.

But, at the same time, the earth is nearer to the moon than the ocean on the other side of it is. The earth is, so to speak, pulled partly out of the ocean on the other side, which remains heaped up behind. Thus the pull of the moon causes a rise of the water on two sides of the earth, the side opposite to it and the other side, *i.e.* the antipodes. At the same time the water on the surface at right angles to the pull, where the moon's attraction is least, is low tide on both sides of the earth.

The same effect, precisely, is produced by the pull of the sun, but in a less degree because the attraction of the sun is not so strong.

But, twice in the month, at New Moon and at Full Moon, the moon is in the same line as the earth and the sun. The sun and the moon pull the water in the same direction. The force of attraction is then the *sum* of the two attractions, *i.e.* it is that of the moon added to that of the sun. The tide rises much higher and is called the *Spring tide*, as shown in the bottom figure.

Also, twice in the month, in the first quarter and the last quarter of the moon, as shown in the lower figure, the attraction of the sun acts *against* the attraction of the moon. The moon and the sun are pulling the water different ways. The force is

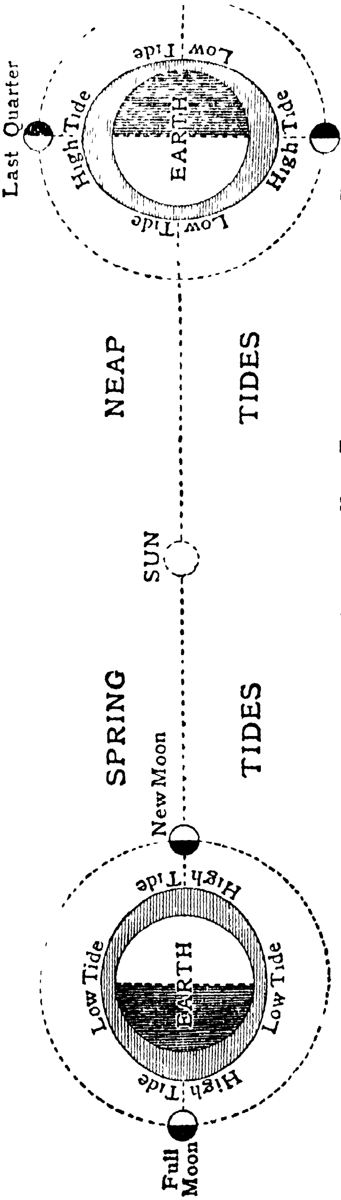


Fig. 136.—Spring Tides and Neap Tides.

now the *difference* of the two attractions. The tide rises much lower than before. It is called the *Neap tide.* At Calcutta, far up the River Hoogly, the water rises about 15 feet at spring tides and about 6 feet at neap tides.

In the open ocean, the rise of the tide or *tidal wave,* may be only a foot or two and even less. In a land-locked sea like the Mediterranean or Baltic, it is only a few inches, so that seas like these are practically tideless. But when the tidal-wave comes to shallow water or to a narrow bay with a wide opening it is heaped into a great wave. In the Bay of Fundy, in North America, it rises to 70 feet, this being the highest tide in the world. In the Bristol Channel, which opens to the west, the tide of the Atlantic Ocean rushes up the estuary of the Severn in a wave 40 feet high. This tidal wave is called a *Bore.* It is highest where the bay or estuary opens out towards the direction from which the tide comes.

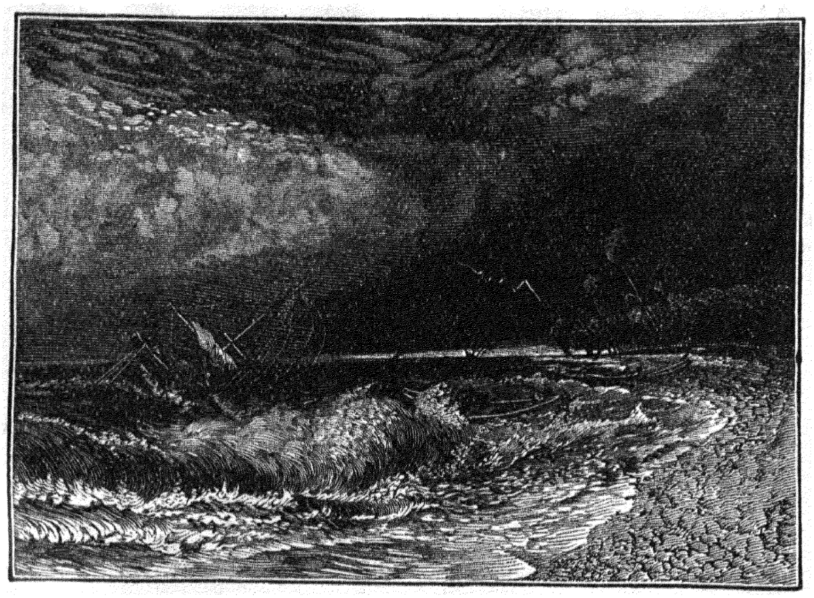


FIG. 137.—BORE IN THE HOOGLY RIVER.

The Bore rises rapidly in the River Hoogly in Bengal Here the estuary narrows suddenly and the tide often rises 7 feet, and when there is a thunderstorm at the same time, as there often is in the monsoon, boats and small ships are wrecked, and many lives are sometimes lost.

Tides are of great use in two ways. They scour out and clean the estuaries and mouths of great rivers which are often full of the dirt washed into them by great cities on their banks, and carry the dirt away to a distance in the ocean as they ebb. Also they make it possible for large ships to enter ports which they could not reach without the tide. Most of the rivers in the North Sea, *e g.*, are shallow, but when the tide raises the water at their mouths from 5 to 20 feet, they admit very large ships and become excellent harbours "If the North Sea were tideless like the Baltic Sea, London would be an inland town far out of the reach of shipping." But large ships and great steamers and huge barges float up the Thames quite easily, on the flood tide, right into the heart of London.

56. THE OCEAN AND ITS MOVEMENTS (*contd.*).

CURRENTS.

THE rocky crust of the sphere of the earth is the Litho-sphere. The air resting on it is the Atmo-sphere. The ocean of water may be called the Hydro-sphere or water-sphere. It covers about three-quarters of the earth's surface, the rest being land. The surface of the ocean, when calm, is everywhere more or less on the same level. We call it the sea-level, and from it we measure height upwards and depth downwards.

If there were no water in the ocean, so that we could see the bottom, we should find that it looked very much like the surface of the land. On it there are vast plains, deep valleys, huge plateaus, high peaks and ranges of lofty mountains. All ocean islands are merely the summits of ocean mountains, of which the bases and slopes lie far below, in the water. The long lines of islands along the eastern coast of Asia are the summits of a lofty range of volcanic mountains, like the Andes of South America, rising from the depths of the Pacific Ocean.

The form of the land that lies beneath the ocean has been ascertained by "sounding," *i.e.* by letting down long lines of wire rope, with weights at the ends, into the sea. The weight sinks to the bottom and the length of the line that goes under water shows the depth The greatest depth in the Atlantic Ocean is in the West Indies, where it is over 27,000 feet. In the Pacific Ocean, near New Zealand, a depth of about 30,000 feet has been found. The height of the ocean mountains rising from these depths is much the same as that of the highest land mountains, *e.g.*, the Himalayas

The great oceans of the world—the Atlantic, the Pacific, and the Indian Oceans—were probably formed in the way described in Lesson 12, when large tracts of the cooling crust of the earth were raised and formed continents, while other large tracts sank and were filled by the inrushing water, now called seas, bays, and gulfs. The Arctic and Antarctic Oceans were probably formed in the same way.

There are smaller seas which may be called *Enclosed Seas.* They are nearly surrounded by land, *e g* the Mediterranean, the Black Sea, the Sea of Marmora, and the Baltic Sea in Europe; Hudson Bay and the Gulf of Mexico in North America , the Red Sea, the Persian Gulf, and the Japan Sea, and Sea of Okhotsk in Asia These seas are shallow when compared with the oceans, and were probably formed long after them, by the sinking of smaller tracts in the middle of the land Other seas are termed *Inland Seas*, such as the Caspian Sea and the Aral Sea The water in them is salt, and seals and other ocean animals are found in them. They are probably parts of an ocean which once covered Siberia and the Steppes north of the Caucasus, but retreated northwards when the land uprose beneath it.

There is a ceaseless coming and going of water between the sea, the air, and the land, by evaporation. But the vapour that is always rising from the sea is pure water, while the water in the sea is salt. The salt does not evaporate. It is left behind. The sea, however, does not get salter and salter, so far as we know. There are three reasons for this. The rain which falls into it is nearly pure water. The rivers pour into it water which is comparatively fresh, although it also contains some salts. Lastly, the salts in the sea-water are continually being taken out of it by enormous masses of sea-plants, floating in the water, and by countless millions of tiny marine animals whose shells and bones are made out of the sea-salts They sink to the bottom and make sedimentary rock

The temperature of the surface water of the ocean varies like that of the air, and is due to the same causes. It varies with the seasons, with latitude, and with the direction of the great ocean currents. The sun shines upon the sea as well as on the land and the zones of sun-heat include the sea as well as the land. There is a broad belt of warm water in the hot belt, in the Tropics, where the average annual temperature is 80°. In the Red Sea, it often rises to 100° To the north and to the south of the Equator, we find that the water gets cooler and then colder as we pass from the cool to the cold zones of the earth. In the Polar seas, the temperature sinks to 32°, the freezing-point, and here the surface is covered with ice. The water in the great depths of the ocean, however, is always very cold in all latitudes, even in the Tropics.

The air over the ocean is warmed or chilled by it, according to the temperature of the surface water on which it rests. It spreads the warmth or the coldness, which it gets in this way, over the land across which it moves Warm water laving the shores of a country does not make the land warm by touching or flowing up to it. But the warm wind, coming from warm water and blowing over the land or resting on it, warms it. The climate of a country over which warm winds (usually westerly) blow, is therefore warm, while cold northerly winds (in the northern hemisphere) make a climate cold.

A movement of the ocean—the flow of its water in any direction—is called a *Current.* Currents are caused in three ways. There are currents due to convection, where cold water takes the place of warm water and warm water that of cold water; wind or drift currents, where the surface water is driven along by the wind; and tides, due to the attraction of the moon.

Convection Currents.—These are exactly like those shown, on a small scale, in Figs. 132 and 133. There is a constant flow of cold water from the icy Polar regions towards the Equator. The heavy cold water at the Poles sinks to the bottom and creeps along the bottom of the deep seas towards the Tropics. Above it, the warm upper layers of water move in the opposite direction, from the Equator towards the Poles to take the place of the water that has moved away. When the cold water reaches the equatorial region, it rises to the surface to take the place of the water which has moved away. There it is gradually warmed, and moves back again as a surface current towards the Poles. There is thus a constant circulation of salt water, warm upper currents moving towards the Poles and colder lower currents moving towards the Equator. That the surface water is as a rule warm, and the lower water cold, has been proved by thermometers, made for the purpose, which are let down into the sea and mark the temperature at different depths.

Wind-waves are caused by the wind blowing continuously over the surface of the water, which rises and falls in long lines, just as the tops of the stalks in a cornfield bend and rise again under a wind blowing over them. A very strong wind will often raise waves from 30 to 40 feet high. After a storm, the waves continue to heave and roll for a long time after the wind has ceased. This heaving water is called *ground-swell.* When it reaches a reef of rock in the ocean, it breaks against it and is called *breakers.* Where the rolling waves come to a low beach they break in long lines of *surf.*

Wind or Drift Currents.—When wind blows over the ocean, it pushes or drives along an upper layer of water which may be of any depth, according to the strength of the wind, from a few feet to about 500 feet. It drives the water along in the same direction in which it is blowing. The winds, therefore, show us the direction of the currents. The currents of water follow and depend upon the currents of air above them. This will be clear if Fig. 139 of the great ocean currents be compared with Fig. 134 of the chief winds of the world. In both maps the arrows show the direction in which the currents of air and water flow.

The Equatorial Current.—The trade-winds drive the surface water of the ocean towards the Equator. The N.E. trade-wind and the S.E. trade-wind set in motion two great currents, which unite when they meet and flow in a general westerly direction as the Equatorial Current across the Atlantic and Pacific Oceans. The depth of this current is about 300 feet, and the rate at which it moves is about 18 miles an hour. If there were no land masses in the way, this broad stream of warm water would flow right round the globe, moving slightly to the north in summer and slightly to the south in winter, under the line of greatest heat of the solar rays. But the continent of America, which divides the Atlantic Ocean from the Pacific, divides all

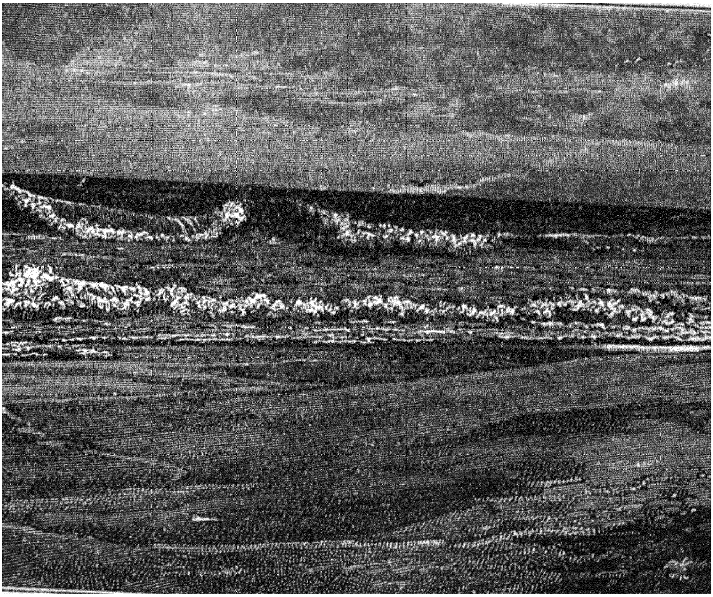


FIG. 138.—SURF ON A BEACH.

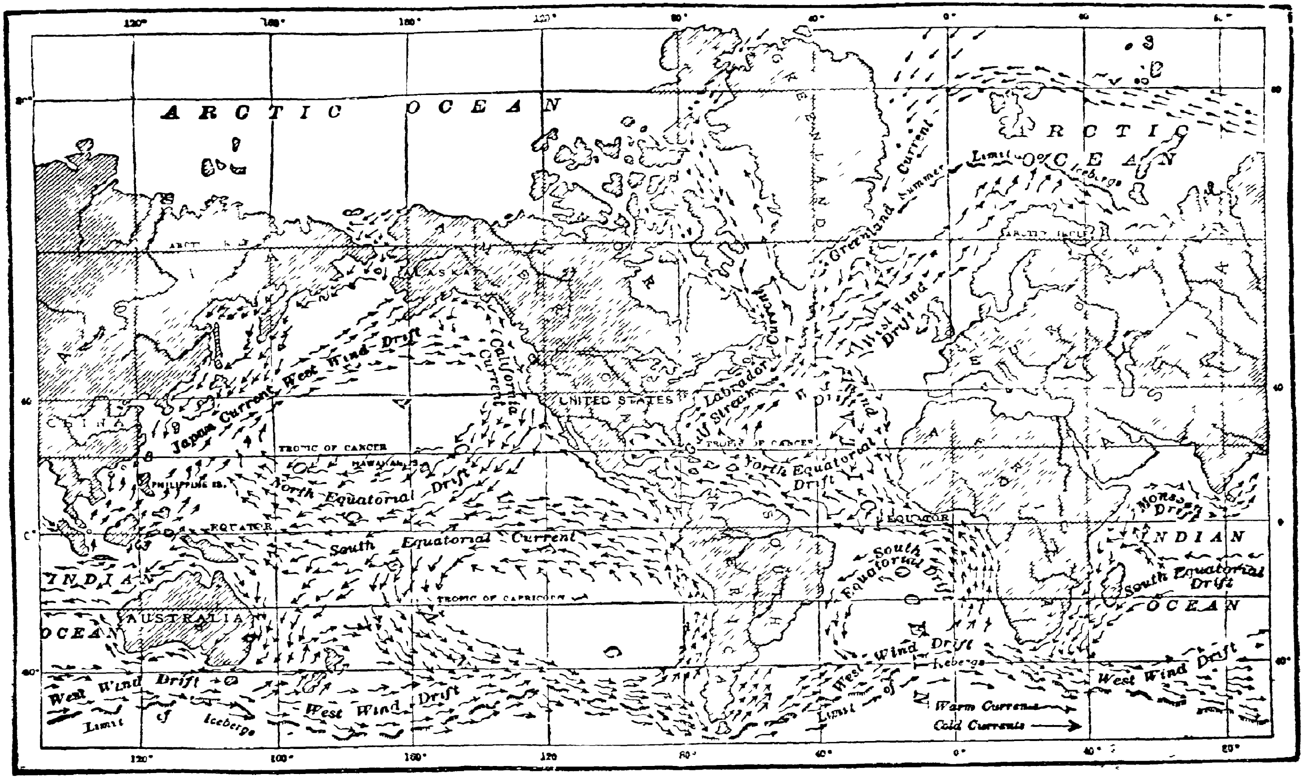
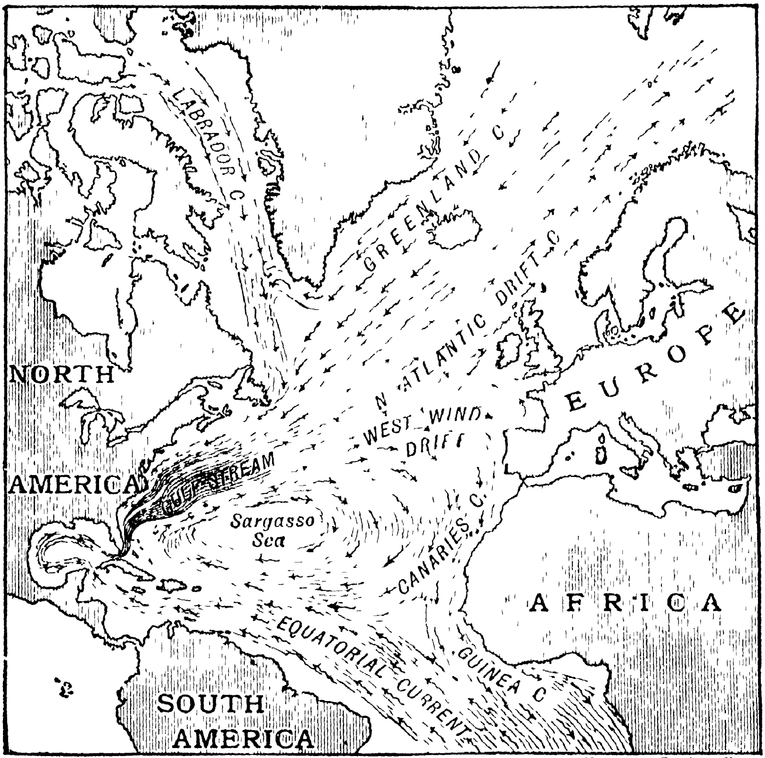


FIG 139 —THE GREAT OCEAN CURRENTS.

the great ocean currents into two systems, one of which may be called the Atlantic and the other the Pacific system, as Fig. 139 shows very clearly.

The names of the currents in each ocean may be learned from Fig 139, and the direction in which they flow is shown by the arrows.



Walker & Cockerell sc.

FIG. 140.—THE GULF STREAM.

One of them, however, may be described in more detail. *The Gulf Stream* is one of the great currents of the N. Atlantic ocean. The South Equatorial Current, driven onward by the S.E. trade-winds, may be said to start from the west coast of Africa. It then flows across the Atlantic to South America, which here projects far into the sea. Here the current divides into two branches. The smaller flows southwards, but the larger branch flows round the coast northwards into the Caribbean Sea and the Gulf of Mexico. Here the air is very hot. The current under the name of the Gulf Stream flows through the Strait of Florida as a warm and swift "ocean-river" into the open sea. It here has a breadth of about 50 miles, a temperature of about 81°, and moves at the rate of about 5 miles an hour. It is joined by the North Atlantic drift. It then bends away to the north-east, but spreads out, flows more slowly, and is lost in the North Atlantic drift, which, as a wide stream of comparatively warm water, is driven by the south-westerly winds past the western shores of the British Isles to the north of Norway. The air current over this stream is warm and filled with water-vapour. It carries warmth and rain over the west of Ireland and England.

Within the sweep of the Gulf Stream lies a wide area of calm water known as the Sargasso Sea. Great quantities of seaweed (*Sargassum*) grow in it and give it its name.

The Labrador Current is a stream of ice-cold water, filled with icebergs, which comes down the east coast of Labrador and North America as far as Newfoundland. The air over it is intensely cold. It blows over the east coast of North America and makes the climate there much colder than that of the British Isles, which lie in the same latitude. Off the coast of Newfoundland, the moist air which rises from the Gulf Stream is condensed by the cold air from the Labrador Current into heavy fogs, dreaded by sailors. Here the giant steamer *Titanic* struck an iceberg in 1912, and over 1600 passengers lost their lives.

57. CLIMATE.

THE term *climate* we get from the Greek word *klimata* which means *slopes*. The old Greek geographers were probably thinking chiefly of the mountain slopes of their country when they first used this word. They knew that the air felt colder as they went up the slopes of the mountains.

We use the word climate in a wider sense. It is the *average state of the weather*, as regards temperature and moisture. We talk of the weather every day. We say, "It is fine weather to-day," if the sky is bright and clear and the air feels fresh and pleasant. We say, "It looks as if we shall have bad weather to-morrow," if the sky is covered with clouds and the wind is rising. Taking all the days in the year, if in any place there be many more rainy days than clear days, we say that the climate is *damp* or *moist*. If the weather does not change much from day to day, we say that the climate is *equable*. If it be never very hot nor very cold, we call the climate *mild* or *temperate*. If it be sometimes very hot and sometimes very cold, we say that the climate is *extreme*.

Climate depends mainly upon the temperature of the air and the amount of moisture in it. It is the air around us that warms us or chills us. We have already learned the causes of changes in the temperature of the air, and therefore we know upon what climate depends, that is to say, we know what the *factors* of climate are. A factor (Latin, *fac*, "make") is what makes or causes.

The chief factors which determine the climate of any place are these:

1. Latitude or distance from the Equator.
2. Altitude or height above sea-level.
3. Situation as regards sea and land.
4. Prevailing winds.
5. Soil and vegetation.
6. Position as regards ranges of hills or mountains.

Latitude.—The lower the latitude of a place is, the higher is the temperature of the air around it (at the sea-level), the more the moisture in the air and the heavier the rainfall. Places in the Tropics are within the range of the direct rays of the sun. Places beyond the Tropics get only the oblique rays, and the farther from the Tropics they are the more oblique are the rays. And, as we saw in Lesson 53, the heaviest rainfall is in the Tropics, where there is a zone of constant rain.

Altitude.—The higher a place is above the level of the sea, the less warmth the air around it gets from the dark heat rays from the earth. There is less air above it, and this air is much rarer than the air at the sea-level. As we saw before, the air acts as a blanket to the earth, it keeps in the heat and prevents it from rising from the surface by radiation. The denser the air, the thicker and warmer the blanket, the rarer the air, the thinner the blanket.

The various degrees of temperature of the air—from hot to warm, warm to cool, cool to cold, and cold to freezing,—as felt in going from the Equator towards either of the Poles, are also felt in going up a high mountain, even though it rise from the line of greatest heat in the Tropics. There is perpetual snow above the height of about 13,000 feet on the southern face of the Himalayas, while the thermometer may show 100° of heat in the steamy plains of Bengal at the base, in the same latitude.

At great altitudes, the air is very dry, for cold air cannot hold moisture. But at lower altitudes, *e.g.* on the Western Ghats in the Deccan and on the Khasi hills in Assam, there is very heavy rainfall when the wind blows in from the sea.

Situation as regards land and sea This factor of climate is very closely connected with the next and depends upon it. Places near the sea have, as a rule, a much milder climate than those which are far inland. The climate of such places is often called *maritime* and sometimes *insular*, because islands have it in perfection. Such places have cooler summers, warmer winters, and moister air than inland places far in the interior of a continent. Here the climate is called *continental* or *extreme*. But the mildness of countries with a maritime climate is due to the winds which blow over them. Warm sea-water washing the coast of a country does not warm it by conduction. The heat does not pass to the land from the water directly, although the one may be touching the other. The warmth in winter, and the coolness in summer, are carried by the wind blowing from the sea to the land. For this reason, countries situated on the shores of the ocean, *e.g.* France and Spain in the west of Europe, have a far milder climate than countries like

Poland and Russia in the east of Europe, where the sea is at a great distance.

Prevailing Winds.—Upon the direction of the winds depend largely the temperature and the rainfall in any country. The British Isles have a far milder climate than Newfoundland in the same latitude, because the warm south-westerly winds from the Atlantic blow over them for many months in the year, while Newfoundland, in the same latitude, is exposed to the icy blasts from the Labrador current blowing down from the Arctic Ocean.

Soil and Vegetation.—Wet marshy ground makes the air above it damp and cold. Heavy fogs lie over land like this. Different kinds of rock, and the soil formed from them, absorb and radiate heat at different rates. Sandstone and loose sand heat up, cool down, and dry up very fast. The great sandy deserts of the earth are intensely hot in the daytime, but radiate their heat so quickly into the dry air above them that they are bitterly cold, often at freezing-point, in the night-time. The climate is so extreme that the thermometer often ranges from 100° to 32° in twenty-four hours. If the soil be fertile and covered with forest, the temperature of the air above it is cooler in the day and warmer at night than if the ground were bare, for leaves of trees do not heat readily.

Position as regards Ranges of Hills or Mountains.—The side of a mountain range on which wind blows is the windward side. The other side away from the wind is the leeward side. Ranges of hills shelter countries on their leeward side, just as a high wall shelters a man who stands behind it in a gale of wind. Warm moist winds from the ocean blow upwards along the slope of a chain of mountains opposite to them, and the moisture is condensed as the wind reaches the summit and falls on the windward side. The countries on the other or leeward side get no rain or very little, and have a dry climate. This is the reason why countries on the west or windward side of the Western Ghats get so much rain and have such a damp climate, while the countries on the eastern or leeward side have a very dry climate. The Himalayas shelter the valley of the Ganges—the United

Provinces, Behar, and Bengal—from cold northerly winds, and these countries have a warm climate. They also shut out the warm equatorial winds from Tibet and the plateau of Central Asia, where the climate is extreme.

58. CLIMATIC REGIONS OF THE WORLD.

BEARING in mind the factors of climate, we may divide the surface of the earth into tracts or regions, each of which has more or less the same climate, and therefore the same class of plants and animals, other than man. Man can live in almost any part of the world. He can wear more or less clothing according to the climate, he can build a house to shelter himself from bad weather, he can warm himself by fires. Other animals and plants cannot do all this. Plants can only grow in a climate that suits them, and animals, other than man, especially wild animals, can only live in a climate suited to them. Birds, indeed, migrate, or fly from cold lands to warm regions, living in different countries at different seasons, but beasts cannot do this.

A *climatic region*, or "geographical unit" as it is sometimes called, has therefore its own kind of land, its own climate, and its own plants and animals. A region of this sort is very different from a "country," which is a division of land under one government. A region may include several countries; *e.g.* Holland, Belgium, and Denmark are three countries all in the same region. On the other hand, a large country, such as the United States of America, includes several climatic regions.

The first and clearest division of land that can be made, into natural regions, is that shown in Fig. 16, which divides the whole surface of the earth into wide spaces or belts in accordance with their temperature.

These divisions are: (1) the Tropics or Hot belt, (2) the Warm Temperate belt, (3) the Cool Temperate belt, (4) the Cold belt.

These broad belts or zones of temperature stretch across the earth from east to west, like the parallels of latitude. They pass through all the continents.

But each of the continents is surrounded by the ocean, and nearness to the ocean is another factor of climate. A region bordering on the ocean has a maritime climate, while the interior of a continent has a climate that is extreme or continental. The direction of the prevailing winds may to some extent affect these conditions.

We have, therefore, to subdivide the four great natural divisions already mentioned. Each continent may be roughly divided into three long strips or spaces from north to south, more or less in the same direction as the meridians of longitude. These spaces will be: (1) the eastern margin, (2) the western margin, (3) the interior, lying in the centre, between them. Also, in the south of Asia – which does not run, like America and Africa, from north to south, but from east to west, and presents a broad face to the Indian Ocean—there is a monsoon region. These five regions may be considered subdivisions.

There is also another important factor of climate—altitude. This gives further subdivisions into (1) lowlands or plains, (2) plateaus and mountain ranges.

Thus we have the following regions with their subdivisions:

I. *The Cold belt, i.e.* the Arctic or Polar regions
   1. Lowlands or Tundras.
   2. Highlands, often called the ice-caps of the world. They are cold deserts.

II. *The Cool Temperate belt.*
   1. Western margin—maritime.
   2. Eastern margin—maritime.
   3. Interior highland—cold.
   4. Interior lowland—extreme.

III. *Warm Temperate belt.*
   1. Western margin—maritime.
   2. Eastern margin—extreme, owing to the winds.

3. Interior highlands—extreme.
4. Interior lowlands—extreme.

IV. *The Hot belt or Tropics*

Here the great heat and constant rain give us subdivisions of a different kind. They are:

1. Monsoon lands wet and warm.
2. Interior—dry and warm.
3. Deserts—extreme.
4. Highlands—extreme and cold where very high.

We need not here name the countries in each of these regions. It will be a useful exercise to find them in the maps in Figs. 16 and 128. Remarks on the climate of the various countries of the world will be found in the description of each given later on in this book.

59. PLANTS AND ANIMALS OF THE WORLD.

ZONES OF VEGETATION.

EACH of the chief climatic regions has its own plants and animals. There they flourish, though some animals, which belong properly to one region, may be found in another, to which their ancestors strayed in past ages. But when this is the case, their colours and even their habits and their food change, so as to suit the new region where they have lived for perhaps thousands of years. The fox, *e.g.*, is found in nearly every country, but in the Arctic regions it is white and lives on fish, in other regions it is grey and eats tame birds, which it steals from farmyards; elsewhere it is brown, and its food is the flesh of wild birds which it catches. The bear is black or white or brown in different regions, and it lives on fruit or flesh or fish according to the region which it now inhabits.

Although the eastern and western hemispheres have more or less the same kind of climatic regions, the same soil, and the same temperature, yet we find that in the Old and New Worlds the animals, though they may be of the same kind, are not the same in size and appearance, and therefore have different names. Instead of the Old World lion we find, in the New World, the puma, for the tiger, we find the jaguar; for the huge elephant, hippopotamus, and rhinoceros, there is the much smaller tapir, the camel is replaced by the vicuna, and instead of apes and baboons, we find flat nosed, long-tailed monkeys.

The first home of a plant or animal is often called its *habitat.* Here the climate suits it exactly. Animals often wander into other regions close by, where the more hardy of them continue to live. The chief barriers to the migration of animals are the sea, deserts, and lofty mountain ranges. The animal (other than man) which has wandered farthest is the dog, which was tamed by man at a very early period and went with him wherever he went, and is now found in every region and every part of the world. A dog can eat whatever man can eat. In cold climates he lives in his master's house or hut, and his skin grows thick and is covered with hair to keep him warm. In warm climates he lives in the open air and his skin is thin.

When we look only at the flora or vegetation, *i e.* the plants large or small, that grow on the earth's surface, we may divide the land into—

Forest, Grass-land, Desert.

In a *forest* the trees grow thickly, close to one another. It is too dark for grass to grow underneath them, for grass will not grow out of the sunlight. On the outskirts or margin of a forest, the trees open out, grass grows and there are wide grassy glades Here there is *park-land* or *wood-land.* Gradually, as the climate changes from hot to warm or cool, and there is less rainfall, we have wide belts of *grass-land,* where trees are few and far between and where there are often no trees at all. As the climate gets colder, even grass does not grow properly, there are only low thorny shrubs and mosses. *Deserts* are hot or cold. The former are covered with sand or loose stones and the latter with snow or ice, and in neither is there any vegetation. The ground is bare.

The general rule as to the plants or *flora* and the animals or *fauna* of countries is this—warmth is favourable and cold is unfavourable to animal or vegetable life. What plants want is *heat*, with *light* and *moisture*. The largest trees and the biggest land animals are found in the tropical region. As we go northwards or southwards from the Equator towards the Poles, trees and plants and wild animals get fewer in number and smaller in size. In the Arctic regions no trees at all are found, the plants are small and stunted, animals are very few in number, and even the men who live there are dwarfs. At the Poles all life ceases.

Fig 141.—Fir (*Conifer*).

Plants get their food from the soil and the air. Their leaves take in carbon from the carbonic acid gas in the air, and their roots take in mineral food from the soil. But plant food in the soil must be dissolved in water to be absorbed by the roots. Therefore plants cannot live without water. Rainfall varies all over the world. Where there is abundant rainfall, plants of every kind grow and flourish. As rainfall diminishes, fewer and fewer plants are found. The rainfall map of the world shows us also the great forests of the world.

Evergreen trees are always in leaf, for as the dead leaves fall, others take their places. Teak, mahogany, and ebony are evergreens. *Deciduous* trees shed their leaves in winter and then their branches are bare. Nearly all trees in the British Isles are deciduous, *e.g.*, the oak, the ash, the elm, and the beech.

Coniferous trees have fruit in the form of cones. The pine, the fir, and the larch are all conifers

The "*Zones of Vegetation*," corresponding, nearly, with the climatic regions of the earth, are, *roughly*, those given in Fig. 142. They show the chief "types" of vegetation in the latitudes marked by the figures on the right. *All* the land, *e.g.* between 20° and 30°, is not desert, but deserts are the *type* or chief feature of this zone.

1. *The Equatorial Forest belt* includes the zone of constant rain and extends about 10° north and 10° south of the Equator. In the hot damp climate of this region, dense dark evergreen forests grow. Huge creeping plants, with stems a foot thick, cover many of the giant trees or hang from their branches. In the basin of the Amazon these forests are called *Selvas*. There, and in the basins of the Congo and the Zambesi, the growth is so thick that the ground below is in perpetual twilight. The monkeys that live in these forests go from tree to tree, 50 or 60 feet above the ground, and never come down. Palms of every kind and the banana flourish, especially near the sea. The animals whose proper home is the Tropics include lions, tigers, leopards, rhinoceroses, crocodiles, camels, and giraffes; huge serpents like the python and boa-constrictor; and numbers of birds of every size and colour. Here, too, huge monkeys live, the gorilla, chimpanzee, and orang-utan. There are countless swarms of insects, ants, flies, mosquitoes, spiders, and many others.

8. *Snow and Ice.*	90°
7. *Tundras.*	75°
6 *Pine Forests*	55°
5. *Deciduous Forests*	45°
4. *Steppes*	30°
3. *Deserts.*	20°
2. *Tropical Grass-Lands.* *Monsoon Lands.*	10°
1. *Equatorial Forests*	0°

FIG 142 —ZONES OF VEGETATION.

The equatorial forests are full of valuable timber trees, such as mahogany and ebony. Here, too, grow trees which yield rubber, quinine, and many valuable drugs. The forest regions are inhabited by half-savage Indian tribes.

2. *Tropical Grass-lands.*—To the north of the Equatorial belt, the forests thin out and there are vast open stretches of grass-land known in America as *Savannas* and *Llanos* and in Australia as *Downs*. Grass, which requires sunlight and cannot grow under shade, here flourishes exceedingly, and these grass-lands make good grazing grounds When the rainfall is good, the land is cultivated, and grain, which is merely the seeds of cultivated grasses, such as rice and wheat, grows well In this region, however, the rain is variable, and there are frequent famines and droughts. In the African savannas, elephants, rhinoceroses, giraffes, and antelopes are found.

The *Monsoon Lands* lie in this belt. They are in the Tropics and include India and China, inhabited by ancient civilised nations and peoples, with the most fertile land and the densest population in the world. They are the home of the elephant, tiger, and bison, deer of many kinds, jackals, and other animals. Rice, wheat, millets, sugar-cane, tea, coffee, spices, indigo, tobacco, and other valuable plants grow in different parts of this region, some on the hills, and some on the plains, which are well watered by mighty rivers.

3. *Tropical Deserts.*—The great sand deserts of the world are found along the margins of the Tropical zone up to about Lat. 30° N. or S., very nearly under the Tropics of Cancer and Capricorn. This region is nearly rainless. In the northern hemisphere there are the Persian and Arabian Deserts, the Thar in India, the Sahara and Nubian Deserts in Africa, and the arid states of Central America. In the southern hemisphere we find the great desert of Central Australia, the Kalahari Desert in South Africa and the desert coasts of North Chile and South Peru. They may be termed also the *Trade-Wind deserts* for they lie in the track of the trade-winds, which, blowing from the N.E. and S.E., that is, from colder to warmer regions, expand, and hold up any vapour that may be in them, instead of dropping it as rain. In North Africa they come

across a vast flat dry land surface, and can drop no rain. In Australia, the interior of the continent is shut off from the S.E. trades, blowing from the moist ocean, by the mountain ranges along the eastern coast. The moist winds blow up the eastern slopes of this range, are condensed by the cold air at the summit, drop their rain on the eastern slopes, and blow over the land to the west as warm dry winds.

In South America, the trade-winds blow across the continent up to the Andes and drop their rain on those lofty mountains, chiefly in the shape of snow, so that the strip of land along the west coast, including North Chile and South Peru, gets no rain and is a desert up to about the latitude of 30°.

The deserts of the Sahara and Arabia are the home of the camel, the "ship of the desert."

4. *Steppes* (partly desert) and (5) *Deciduous Forests.*—These two belts of vegetation are in the *Temperate Zone*, including the Warm Temperate and the Cool Temperate zones. In this zone are found most of the countries and great nations of Europe, North America, North Africa, and Australia In many parts of this tract the natural vegetation has been much altered by man.

The rainfall on the land in the Temperate zone depends very much on the situation of land and sea, and the position of the mountain ranges. The climate varies much more than it does in the Tropics. In very ancient times the face of the land in nearly the whole of Europe was covered with dense forest, mostly deciduous. As men spread over the land and became civilised, they cut down great tracts of forest to make room for the villages and towns in which they lived, and for the cultivation of the land to supply them with food. Wherever the land was cleared, grass sprang up and afforded pasture for sheep and cattle. Thus the ancient forests have been replaced by wood-land, grass-land, and cultivated land.

In these regions there is moderate rainfall in many places and the country is watered by rivers. This is why men settled in them, for men settle only where they can find water. But there are vast tracts in Central Asia, in Southern Russia, in North America, and in South America, where there is scarcely any rainfall, where forest cannot grow, and where grass alone can flourish. Where there is a little rainfall, there is plenty of good grass, suitable for pasture, such as the *Prairies* in North America and the *Pampas* in Argentina in South America. Where the rainfall is very slight indeed and the land is dry, a sort of very poor thin grass grows, and there are, here and there, patches of "scrub" (low thorny plants). These half-desert tracts are called *Steppes.* They occur in south-western Asia, the south-east of European Russia, part of Hungary, and the interior of Spain.

FIG. 143.—OAK.

The driest regions of the steppes pass into true deserts, including the vast tract of sand and rock known as the Gobi or Shamo in Mongolia, the plateau of Tibet, and the sandy wastes in North America, between the Rockies and the mountains of California, called the "Great Basin."

The deciduous trees in the inhabited and cultivated parts of the Temperate zone include the oak, ash, elm, larch, beech, and birch, and in America the maple.

The wild animals of the Temperate zone are wolves, bears, foxes, wild cats, weasels, and badgers.

6. *The Pine Forests.*—In the northern part of the Cool Temperate zone, just below the Tundra region, there is a wide forest region of *Coni-fers* (cone-bearers). These hardy trees grow only in a cold climate which would kill other trees. The *Pine* is the most common of this class, which includes also firs, larches, and cypresses. Pines are found chiefly in Scandinavia, firs in Russia, larches in Siberia and North America. In Siberia this region of conifers is known as the *Taiga*. Pines are also found on the west of the Rockies as in Fig. 144. which is a picture of a pine forest in the Selkirk Mountains in British Columbia. In the foreground there is the Canadian Pacific Railway, which runs from the Atlantic to the Pacific Ocean.

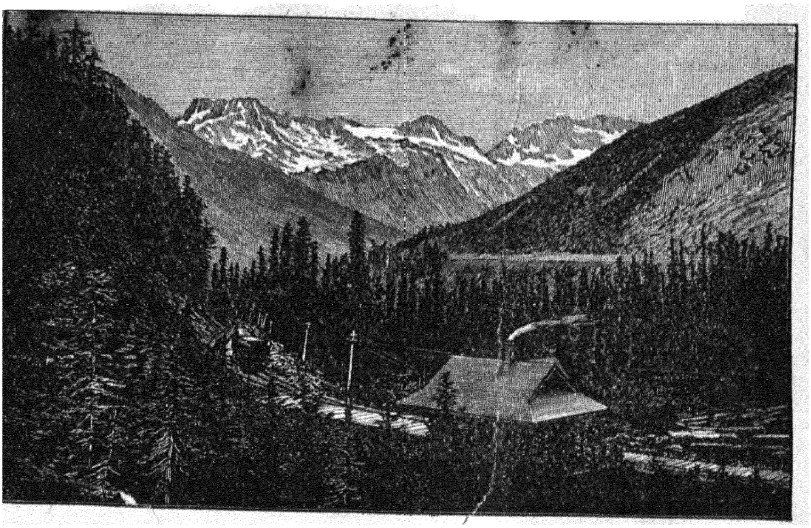


FIG. 144.—PINE FORESTS IN THE SELKIRKS (BRITISH COLUMBIA).

The *Conifers* are so called because their fruit is a *cone*, as in Fig. 145, which shows the leaves and fruit of a pine. The larch is deciduous, but the fir and the pine are evergreens.

The timber of the pine is a soft white wood called *deal*, out of which boards and boxes and matches are made. The soft wood is also made into paper. The sap yields tar, pitch, turpentine, and resin.

7. The *Tundras* are vast plains on the cold lands around the Arctic Ocean, in North America, northern Europe, and northern

Siberia. The soil is itself frozen deep. In winter the Tundra is a great snow desert, over which the Lapps and Samoyeds, who inhabit this dreary region, travel on sledges drawn by dogs or reindeer. In summer the rays of the sun, though feeble, thaw the snow and convert the soil into a swamp, which is soon covered with mosses, ferns, and even coloured flowers. Towards the south, stunted willows and birch trees grow, and the Tundra merges into the Taiga—the pine forests of the Cool Temperate zone. On the north, it passes into the snow and ice deserts of the Polar regions. The nomadic tribes which inhabit the Tundras live by hunting and fishing, and on the milk and flesh of the reindeer.

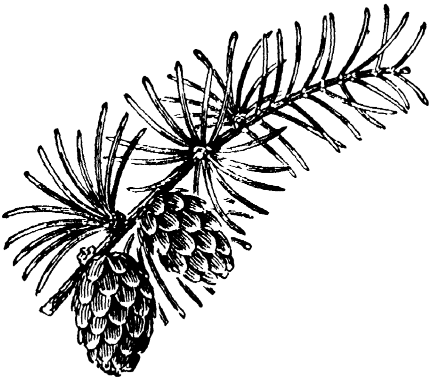


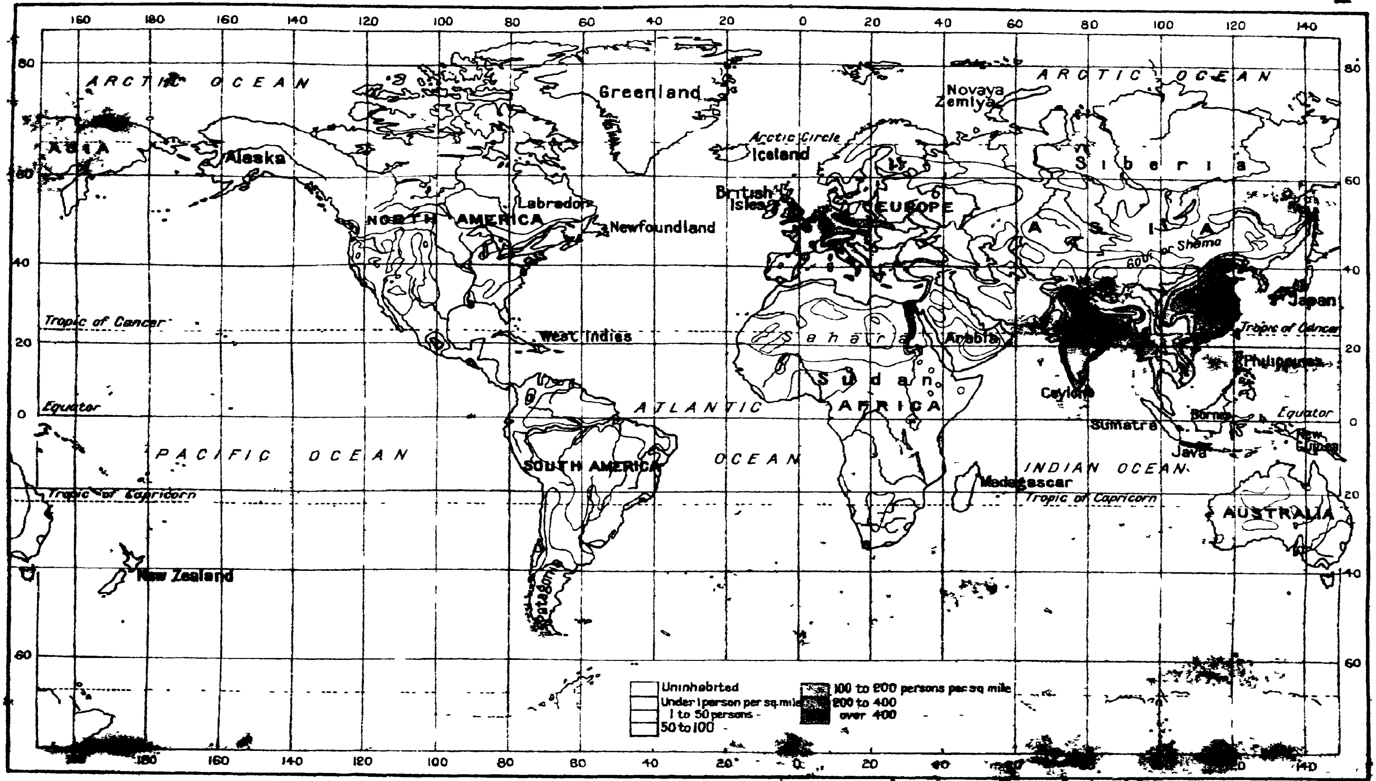
FIG. 115.—LEAVES AND FRUIT OF PINE.

8. *The Polar Snow Deserts.*—The two Frigid zones are the spaces between the Arctic and Antarctic Circles and the Poles. Here there is perpetual ice and snow, for the heat of the sun, in the short summer, is not enough to melt them. Round the North Pole there is a sea covered by floating ice. The South Pole is a lofty plateau covered by thick layers of ice. To it the name of *Antarctica* has been given. The countries in the Arctic Ocean are Greenland and the islands of Nova Zembla and Spitzbergen. A few Eskimo live on the western border of Greenland, where the climate is not so cold as it is elsewhere. Like the Lapps, they live by fishing and hunting the wild animals of the Arctic regions, such as the seal and the whale, and on the milk and flesh of the reindeer, which they have tamed.

Mountain Belts of Vegetation.—As there are belts or zones of vegetation, following the zones of sunlight and sun-heat from the Equator to the Poles, so, too, we find very similar zones of vegetation in ascending ranges of lofty hills. Precisely the same changes of temperature occur (as we saw in Lesson 51)

DENSITY OF POPULATION

2



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from the Equator to the Poles as from the sea-level to a great height in the air. The same kinds of plants are found on the summits of lofty mountains as in the Polar regions, namely, mosses and stunted shrubs In the Himalayas, for example, tropical trees grow at the base of the mountains; such plants as are found only in Warm Temperate regions grow on the lower slopes; then follow the plants of the Cool Temperate zone and, above these, there is the vegetation of the Cold zone.

60. POPULATION OF THE WORLD.

TOWNS.

THERE are supposed to be about 1600 millions of people in the world. Once in every ten years there is a census or counting of the people in the British Empire and in most civilised countries. But in many other countries there is no such census, and the population is, more or less, a guess.

More people live in some countries than in others. Men crowd together in the fertile and well-watered parts of the earth, and in regions where the climate is pleasant and healthy. The rich lands in the basins of the Ganges, the Yangtze Kiang, and the Nile—India, China, and Egypt—have a dense population. So have the British Isles and parts of Europe and North America. In these parts of the world the climate is good, and there are great stores of coal and iron which make it easy to manufacture goods. In countries like these, people crowd together in large towns, where there are factories and workshops.

The *Density of Population* in the world is shown in Map 2 (coloured). The most thickly populated tracts are coloured dark brown. They include the countries just mentioned. Other shades of brown show less thickly-peopled countries. The deserts, where no one lives, are in white. The countries coloured yellow are very thinly inhabited, either because they are arid half-desert lands, or because they are very hot and damp and covered with dense forests, like the selvas in the basin of the Amazon in South America.

Towns grow up in different ways and for different reasons. They are, as a rule, at first villages, which gradually get larger and end in being cities. All men were at first hunters or fishers, and they moved about from place to place. When men began to cultivate fields they had to stay in one place, and they built their huts closely together so that they might be able to help one another in time of need. As time went on, the villagers often built a wall round their village to protect it from attack by other tribes. This was the beginning of a walled city. As water was always wanted, villages were often built on the banks of a river. Fishermen also lived in villages on the banks of rivers or on the shores of the sea.

Thus we find the following classes of towns in different countries:

1. *Agricultural Towns.*—These are in the middle of cultivated land. They are small in size, and in civilised countries have a few craftsmen, such as blacksmiths, tailors, and carpenters, and small tradesmen who supply the farmers with goods, often in exchange for their produce. The buildings, besides dwelling-houses and shops, are usually an inn, a post office, a school, a church, and perhaps a railway station.

A *market town* is in the centre of a number of villages. It is, as a rule, the meeting-place of several roads. Here the farmers come from the country for miles around, to sell their produce, and to take back, in their carts, the goods they need.

A *manufacturing town* is full of factories and workshops, and usually grows up in the centre of a small region where some vegetable or mineral product is produced or can be imported easily. Where flax grows, there linen manufacturers will flourish and a town will be built, *e.g.* **Ulster** in Ireland. Where there is good clay, potteries will be built, *e.g.* in **Staffordshire** in England. Where wool is abundant, there will be towns for the manufacture of woollen goods, *e.g.* **Leeds** and **Manchester** in England. Where there are coal and iron mines close by, there will be large towns with factories for the manufacture of iron and steel goods, *e.g.* **Birmingham** and **Sheffield** in England. Belgium is full of towns like this, *e.g* **Liège** and **Antwerp**.

River towns grow up on the banks of rivers, for before railways were built rivers formed water-ways on which goods could be carried everywhere. India has many such towns, *e.g.* **Benares** and **Patna**. Often such towns grew up at the confluence of two rivers, *e.g.* **Allahabad**. Other towns arose near the mouth of a river up which the tide came, for boats could come up from the sea with the tide. They may be called *Tidal towns*.

Bridge towns are built at the lowest point on a river, where it can most easily be bridged, so that people from both banks may cross it. **London** was probably built where it now stands for this reason.

Gap towns were often built, in the old days, in a gap or narrow passage between a range of mountains and the sea. Such a town would command the roads from both sides. A castle or fort was often built in a gap like this, to keep off enemies. **Edinburgh** is a gap town, built between the Pentland Hills and the sea.

Nodal towns are such as are built at a *node* (Latin *nodus*, a knot), *i.e.* a centre where many roads or railways cross. The best instance of a nodal town is **London** (see Fig. 61), where roads, railways, and steam-routes meet from all parts of the world.

Out-ports are seaport towns on an estuary or bay below a great seaport, which take a part of the traffic, chiefly passengers or light goods, which are then conveyed very rapidly by rail to the main port or to other inland towns, while the heavier and more bulky goods go slowly up the river or bay. **Tilbury** and **Gravesend** are two out-ports of London. Here passengers from India or other countries land and get to London by rail long before the steamer, which brought them, arrives.

An *Entrepôt* is a port to which goods are brought and stored and then sent away to other countries. Nearly half the goods exported from **London** are re-exports of goods which were imported and stored there. They came from other countries and go back to other countries. London can do this because of its central position. It is a vast entrepôt.

Strait towns are built on straits for the same reason that gap towns are built in narrow gaps. They command the passage through a strait. There is always a strong fort in a strait town, with heavy guns which could sink the vessel of an enemy attempting to pass through. **Aden** commands the strait of Bab-el-mandeb, and **Gibraltar** the entrance to the Mediterranean Sea. **Constantinople** commands the sea route from the Mediterranean to the Black Sea.

Mining towns soon spring up where there are large mines, especially gold, iron, or coal, *e.g.* **Cardiff** in Wales (coal mines), **Colar** in Mysore (gold mines).

This table shows the sixteen largest cities in the world. All have over a million of inhabitants

City	Population[1]	Country.
London (Greater London) .	7,250,000	England
New York	5,690,000	United States
Paris	2,906,000	France
Chicago	2,701,000	United States
Tokyo . . .	2,173,000	Japan
Petrograd	2,074,000	Russia
Berlin	2,070,000	Germany
Vienna	1,841,000	Austria
Philadelphia . . .	1,832,000	United States
Buenos Aires . . .	1,674,000	Argentina
Calcutta (and suburbs) .	1,268,000	India
Osaka . . .	1,252,000	Japan
Bombay . . .	1,172,000	India
Rio de Janeiro . . .	1,157,000	Brazil
Moscow . . .	1,050,000	Russia
Constantinople . . .	1,000,000	Turkey

Sacred Places.—Here, too, towns gradually arise around some shrine or ancient temple or on a sacred river, *e.g.* **Mecca,** in Arabia, the sacred city of Muhammadans; **Jerusalem,** the holy city of the Jews and Christians.

Hill-stations or *Sanitaria* in India and *watering-places* in England are similar, for people go to them for a time to escape

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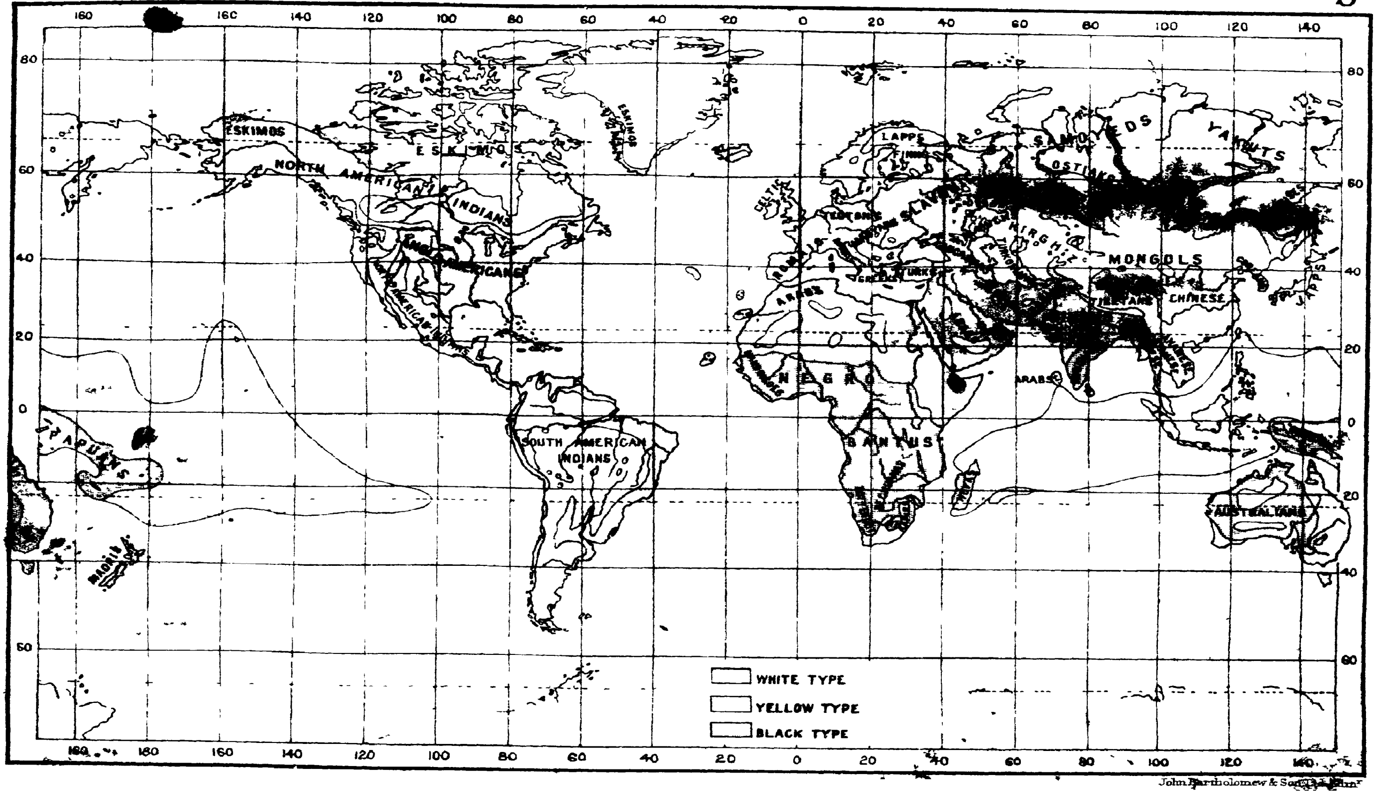
[1] Figures from the *Statesman's Year-Book, 1915.*

RACES OF MANKIND



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the heat or to bathe in the sea. Nearly every province in India has its hill-station, *e.g.* in Bombay there is **Mahabaleshwar**; in Madras there is **Ootacamund.** There are watering-places all along the coast in England, *e.g.* **Brighton** on the south coast and **Scarborough** on the east coast.

61. THE RACES OF MANKIND.

THERE are many nations and tribes of men, and at first sight they seem to differ from one another in every way—in colour and height, in habits and customs, in language and religion, in the food they eat and in the dress they wear, in body and in mind. Here for example, are two men, one of whom is a native of Patagonia in South America. He is about 6 feet 4 inches high.

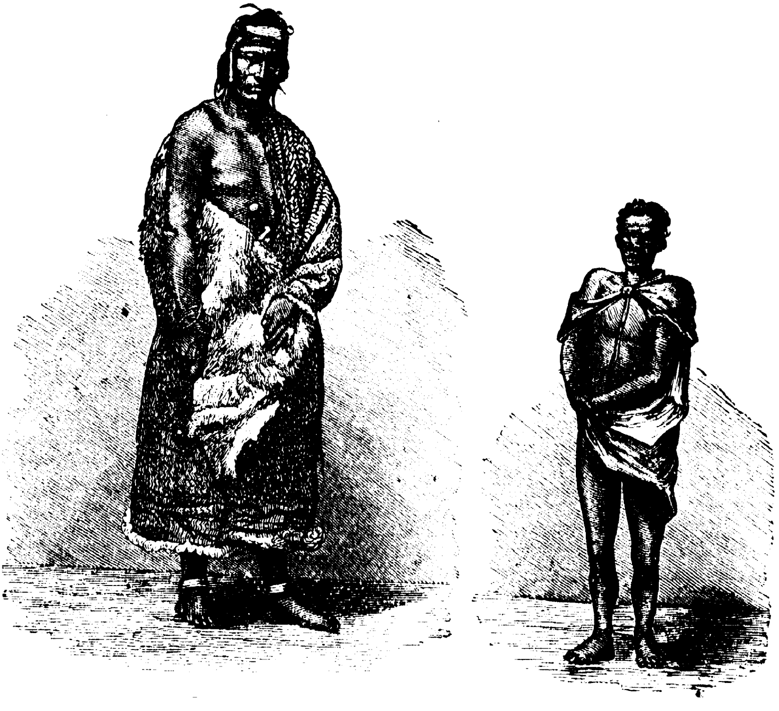

FIG 146.—PATAGONIAN AND BUSHMAN.

The Patagonians are the tallest race in the world. The other belongs to one of the shortest races in the world, the Bushmen of South Africa. He is 4 feet 6 inches high. What two men could look more unlike than these?

Yet, when we examine men in different countries very carefully, we find that we may divide them all into three classes or races. Each of these races differs from the others in three or four ways, while all the men of one race resemble one another in these points. There are a great many subdivisions of these classes caused by intermarriages, by climate, by food, and by habits of life. But we find, among them all, three *types* of men, and all those of the same class are more or less like the type.

The three classes are based, first of all, on *colour*. As we all know, the old Sanskrit word for caste was *varna*, colour. The classes are:

1. White men or *Caucasians.*
2. Yellow men or *Mongolians.*
3. Black men or *Negroes.*

There are two subdivisions of Mongolians:

4. Brown men or *Polynesians.*
5. Red men or *American Indians.*

The other race marks are in the size and shape of the skull, the hair, the jaws, and the mouth.

The Hair.—The hairs on a man's head look as thin as a thread. But they are really hollow tubes. If a hair be cut across and the end looked at through a microscope, it will be seen that it is more or less round, like the edge of a tube. In Fig. 147 there are the cut ends of four hairs: *a*, that of a Mongolian, is quite round; *b*, that of a Caucasian, is oval; *c*,

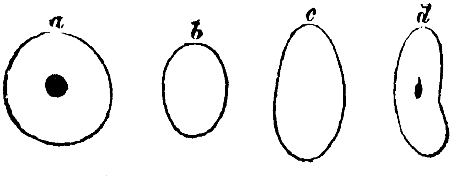

FIG. 147.—SECTIONS OF HAIR OF MONGOLIAN, CAUCASIAN, NEGRO, PAPUAN.

that of a Negro, is a very long oval; *d*, that of a Papuan, is a still longer oval. The Papuan is a subdivision of the Negro. He lives in the islands of the Pacific about New Guinea. There is another way in which the hairs of these classes differ. The hair of the Negro is thick, black, and woolly, like the wool on a sheep. That of the Caucasian is wavy or curly. That of the Mongolian hangs straight down, it has no twist or curl in it.

The *Skull* of the Mongolian is broad and round like his face. He is said to be "broad-headed." The Negro has a long skull and is "long-headed." The skull of the Caucasian is, in shape, between these. He is said to be "middle-headed"

The Face.—The Caucasian has an oval face with a high nose, and his lower jaw is nearly in a straight line with the rest of his face. His eyes are in a straight line. He often wears a thick beard, and has to shave if he prefers to have a smooth face.

The Mongolian has a broad face and a broad nose and almond-shaped eyes with slanting, drooping lids. He has high cheekbones. The hair on his face is scanty. He never has a beard, for he cannot grow one.

The Negro has large round eyes, a flat nose, very thick lips, and his jaws project beyond the line of the face.

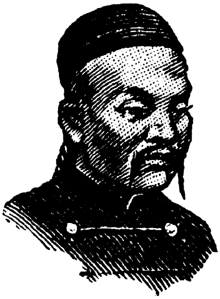

FIG 148
MONGOLIAN CHINESE.

The distinctive race-marks of the Negro and Caucasian (Persian) are clearly shown in Fig. 149—the hair, the jaw, the nose, and the mouth. Add to these that the Negro is black and the Persian white or fair.

The Caucasians are so named because they were formerly supposed to have come at first from the country close to Mount Caucasus, where fine types of the race are still found. There are dark Caucasians and fair Caucasians. The higher-caste Hindus who belong to this race were once white, but have become darker during long residence in a hot climate. The people of North Europe, particularly the Scandinavians, are very fair with blue eyes, while those of South Europe, *e.g.* the Spaniards and Italians, are, as a rule, dark.

There are about 750 millions of Caucasians, 650 millions of Mongolians, and 200 millions of Negroes.

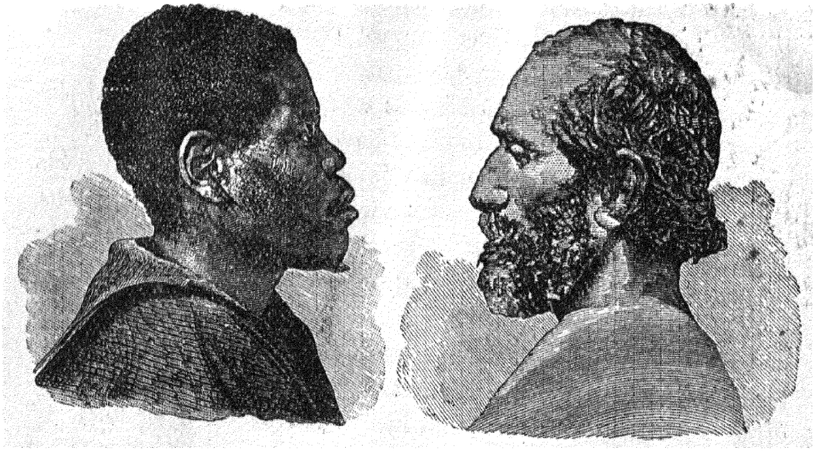

Fig 149.

A Negro. A Caucasian (Persian).

The red men of the world are the native American Indians. They are a fine-looking race, tall and manly with high noses. North America was once inhabited by many tribes of red men, but very few are now left and they seem to be dying out. Their chiefs were fond of wearing feathers on their heads as in Fig. 150. Their red colour was a dark red, like dull copper. They are supposed to have been an offshoot of the Mongolian race, and to have entered America by crossing Bering Straits from Asia.

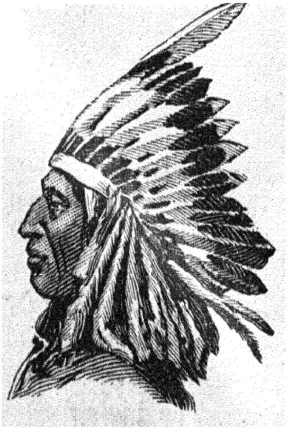

Fig. 150.
North American Indian

The distribution of the three great races of mankind, and the countries they now inhabit, are shown in Map 3. The light streaks of black in the Southern States of America show that although the country is inhabited mainly by white men, there are a good many Negroes there—once slaves, now free.

Similar marks in South America show that American Indians are mixed with the descendants of the Spaniards and Portuguese who conquered and now inhabit the country

62. ASIA

ASIA, the eastern part of the vast land-mass of Eurasia, is four times as large as Europe, the western part. It is by far the largest continent in the world, being half as large again as Africa, and larger than the two Americas put together. It extends for about 5000 miles from the Arctic Ocean in the north, over the Frigid, Temperate, and Torrid zones, close up to the Equator in the south, and for about 6000 miles from the Ural Mountains in the west to the Pacific Ocean in the east. It is also the highest of the continents, with the loftiest mountains and table-lands in the world In it are found the greatest extremes of climate—the greatest heat and the most intense cold ; the heaviest and the lightest rainfall It has the most densely populated countries and the most sparsely peopled tracts in the world. For all these reasons it has been called a "continent of extremes."

In the physical map of Asia (No. 15) may be seen the relief of the continent in colours. Four colours show the different levels of the land—dark green, the low plains and river valleys ; light green, the higher plains from 600 to 1500 feet, light brown, the lower hills and plateaus from 1500 to 6000 feet; darker brown, the lofty table-lands from 6000 to 20,000 feet, and the still loftier mountains that rise on them 8000 or 9000 feet higher.

On the map of Europe we see a wide belt of highland in the south sloping down to broad plains on the north. The mountains are the folded Alpine system. In Asia we see the continuation of the same system of folded mountains, here called the Himalayan system, but the mountains are broader, vaster, and more lofty, and they divide into great ranges holding up between them huge table-lands. The same great plains are there too, stretching away northward, but they are much wider than the European plains and rise on the east into broad plateaus. Like Europe, Asia has three great peninsulas stretching southwards into the ocean, but they are on a vaster scale.

As in Europe, a vast tract of land in the north seems to have sunk, perhaps under the weight of the enormous mass of ice which, millions of years ago, covered it in the great Ice Age. It is now known as Siberia, the great plain of northern Asia. Another great tract to the south sank still lower, and is now the Indian Ocean. Between them were squeezed up the folded mountains of the Himalayan system (see p. 47). The eastern boundary of Asia was, probably, at some distant period in the past, the outside line of the long loops of islands from Kamchatka to Borneo. Ages passed and the land between these islands and the present coast sank, the water rushed in from the Pacific Ocean, and the inland seas were formed—the sea of Okhotsk, the sea of Japan, the Yellow Sea, the East and South China Seas. Up through the long crack in the crust of the earth, along the edge of the sunken land, gushed the lava from the molten matter below and formed a long line of volcanic islands (see Fig 38) of which the largest are the Kurile, the Japan islands, Formosa, and the Philippines. These islands are the summits and higher slopes of volcanic mountains, of which the bases are at the bottom of the sea.

A glance at the map will show that in the centre of the Asiatic highlands stands the lofty plateau of the **Pamirs.** It is from 10,000 to 14,000 feet high, and is ridged by chains of mountains rising 10,000 feet higher. The Persians call it the Bām-i-Dunya or Roof of the World. From this centre extend five great ranges of mountains, eastward and westward, across the continent. But the eastern ranges are loftier than the western; they are wider apart, and enclose between them higher and larger table-lands. Together with the mountain system of Europe, with which they are connected, they form the great Old-World ridge of Eurasia. Collectively they are known as the Himalayan system of mountains. These four ranges, with their outlying ranges, are :—

1. The **Thian Shan** (25,000 feet high), which run to the north-east for 1500 miles through Central Asia (Mongolia), and then, as the **Altai** mountains, bend round to the north-west dividing Turkestan from Siberia. Between these two ranges the land slopes down into Lake Balkash in Turkestan.

2. The **Kuen-Lun** mountains, with peaks of over 20,000 feet, run eastward, forming the northern edge of the plateau of Tibet. They are continued in lower ranges, as the **Khingan** and **Yablonoi** mountains, west of China and Manchuria, and as the **Stanovoi** mountains up to the north-west corner of Siberia.

3. The **Karakorum** mountains, with peaks 26,000 feet in height, run eastwards into the **Trans-Himalaya** mountains across the table-land of Tibet. Below them, to the south of the Ganges-Brahmaputra valley, stretch for 1500 miles the mighty **Himalayas**, the loftiest mountains in the world, with peaks rising to 29,000 feet (see pp. 118-120). They form the southern edge of Tibet, the highest (large) table-land in the world. The Himalayas bend round to the south at their eastern end, and are continued as the **Yomas** of Burma for hundreds of miles southwards.

4. The **Hindu Kush** extend westwards from the Pamirs along the north of Afghanistan, and are continued in the **Elburz** mountains up to the **Caucasus**, which form the connecting link between the Himalayan system of Asia and the Alpine system of Europe. To the south of these ranges lies the plateau of Iran or Persia, and to the north the land sinks into the plains of Turan and the Caspian Sea. An outlying range of the Hindu Kush is the Suleiman (12,000 feet), which runs southward to the Ocean, forming the eastern edge of the plateau of Iran (Afghanistan and Persia).

The highlands of northern Iran, Armenia, and Kurdistan extend westwards along the northern edge of the plateaus of the same name. They vary in height from 6000 to 10,000 feet. **Mount Ararat** is a snow-clad peak (17,000 feet). The **Taurus**, in Asia Minor, is the chief range.

The **Plateaus** or **Table-lands** extend, like the mountain ranges, from west to east. Taking them in this order (see Map 15) they are **Northern Plateaus**: Asia Minor, Iran (Persia, Afghanistan, and Baluchistan), The Pamirs, Mongolia (Gobi) **Southern Plateaus**: Arabia, the Deccan (India), the Malay Peninsula.

The **Northern Plains** (coloured green on Map 15) stretch in a north-easterly direction from the Caspian Sea to the Arctic Ocean. They include Turan or Turkestan and Siberia. The ocean once covered this plain from the Caspian to the Arctic Ocean. The Caspian Sea (the lowest part of Asia, the surface being 85 feet below sea-level) has salt water in it, and the seals in it are like those now in the Arctic Ocean. They were left in it when the sea retired and dry land appeared. Around the Caspian Sea the land is below sea-level. It gradually rises in the north-east of Siberia (as the lighter green on the map shows) to 2000 feet. In the south-west the plain is **Steppe-land**, and in the far north, **Tundra.**

The **Southern** and **Eastern Plains** of Asia are river valleys with large deltas at their mouths, or coastal plains. The chief of them are Mesopotamia or the Valley of the Tigris and Euphrates, the Indus-Ganges Valley; the Valleys of the Irrawaddy, the Mekong, the Yang-tse-Kiang, the Hoang-ho, and the Amur. All these valleys have been made by the silt brought down by the rivers, and are very fertile and thickly populated

RIVERS AND LAKES.—These will be described in the countries to which they belong.

The Climate of Asia.—Owing to its vast size, extending as it does over all the zones, and to the different levels of the land, from below the sea-level to 29,000 feet above it, Asia has every variety of climate. It has the coldest winters and the hottest summers in the world. The coldest known spot on the surface of the earth is a town named **Verkhoyansk**,[1] in the north-east of Siberia. Here the cold is greater than at the North Pole or at the summit of Mount Everest. The average temperature from December to February is about 60° F. below zero (cold which freezes even mercury), and it has been as low as $-92°$ F.

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[1] Lyde, *School Geography*, p. 49.

At this same place the thermometer has been known to rise in July to 100° F.

The climate of Asia is everywhere, except on the coast, extreme. All the northern slope—the northern plain—is very dry; and the cold increases eastward as it does in European Russia; *e.g* it is colder at Yakutsk than at Yeniseisk, and colder at Yeniseisk than at Tobolsk The south-west is also very dry and very hot. All the south-eastern countries are very damp and very hot. The central plateaus are very dry—very cold in winter and very hot in summer.

The icy winds from the Arctic Ocean sweep over all northern Asia. The Himalayan mountains protect northern India from cold northerly winds, and prevent the moist winds from the Indian Ocean from reaching Tibet and Central Asia.

In winter there is high pressure of the air (Lesson 49) over Central Asia, and the winds flow outwards as dry winds in all directions. In summer the land is intensely hot, and there is a vast basin of low pressure into which the winds blow from all directions. These are rain-bearing winds (the S.W. and S.E. monsoons) at first, but the rain falls on the high ranges of mountains (the Himalayas) in the south, which they cross, and they reach Central Asia as dry winds. This is why Central Asia is a vast desert.

Thus we may note five great climatic regions in Asia: (1) The Arctic cold, dry area, within the Arctic circle, (2) The Siberian cool, temperate, continental region, which has no rain in winter, but in the short summer a mean monthly fall of from one to two inches; (3) The Central arid, dry region including Arabia, Iran, Turan, and Gobi; (4) The Monsoon region including India, Indo-China, and China; (5) The Equatorial region, which is always warm and always wet.

The **Zones of Vegetation** are, more or less, those described in Lesson 59. The vegetation depends upon the climate, which has just been described. Upon climate and vegetation depends the distribution of animals. In the far north there is the Arctic region where land and water are covered with ice and snow. Here we find the Polar Bear, the Seal, the Walrus, and the Arctic fox, all found in the north of Europe and America also. The next zone is the Tundra, a region of marshes and mosses where no trees grow. This is the home of the Reindeer. To the south of the Tundra there is a broad belt of coniferous forests in the cool temperate zone of Siberia. Farther south there is an area of thick deciduous forests in Siberia where bears and wolves are found. The arid dry region of Central Asia includes the steppes—the land of camels, horses, and wild sheep and wild goats wherever grass is found. But most of this region is desert. The Yak is found in Tibet. The Monsoon and Equatorial regions include India and China, where numerous wild animals are found, *e.g.* the Elephant, Rhinoceros, Bison, Deer, Tiger, Leopard, Bear, Wild Dog, and many more.

ANIMALS, TAME AND WILD.

There are many wild animals in Asia. All tame animals which are now of use to men were once wild. Corresponding to each of these tame animals there are several wild animals of the same species, which may be called its wild cousins and never have been tamed.

The chief tame animals are the Ox, the Horse, the Sheep, the Goat, the Ass, the Dog, the Cat, and the Pig All of these but the horse has its wild cousins in Asia. Wild horses (zebras) are, however, found in Africa.

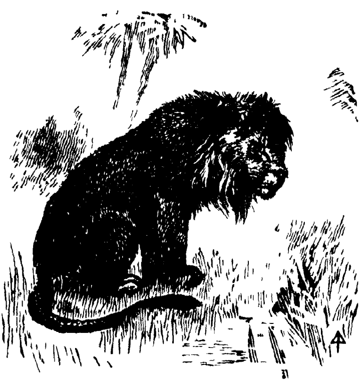
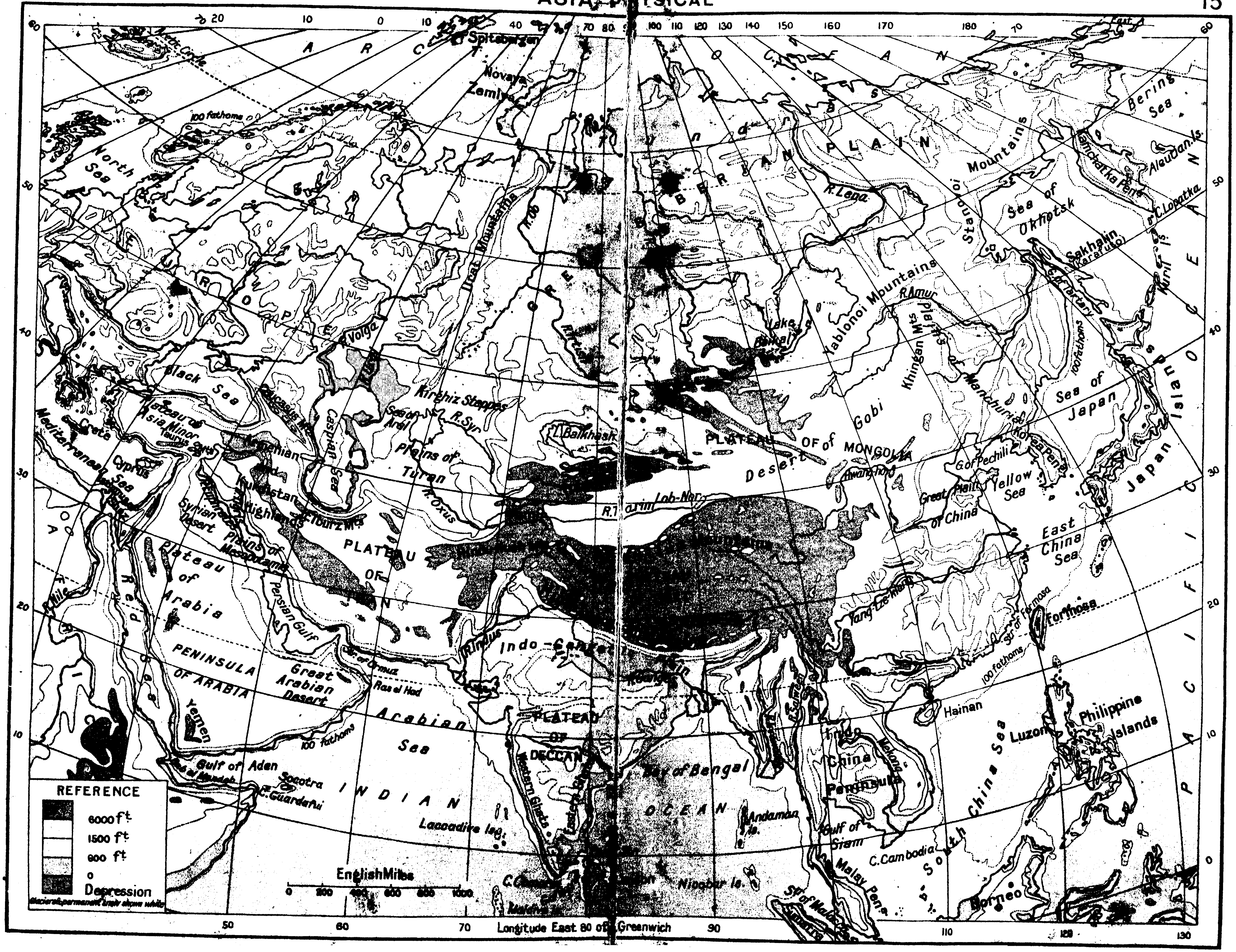


FIG. 151.—MANELESS LION OF GUJERAT.

Wild Cats.—The chief of these are the Lion, the Tiger, the Leopard, and the Cheetah. They are the largest of the cat tribe. They can draw back their claws into their paws like cats, and so move over ground noiselessly. Like cats, too, they can see better at night, when it is nearly dark, than in the day.

The *Lion* was once found in many parts of India, but is now

ASIA—PHYSICAL



en in one small part of the country only. This species has very short mane d is still found, but arely, in Gujerat. he other kind with long mane is found Africa and (in Asia) Persia and Syria. he lion sleeps all day thick jungle and rowls about at night.

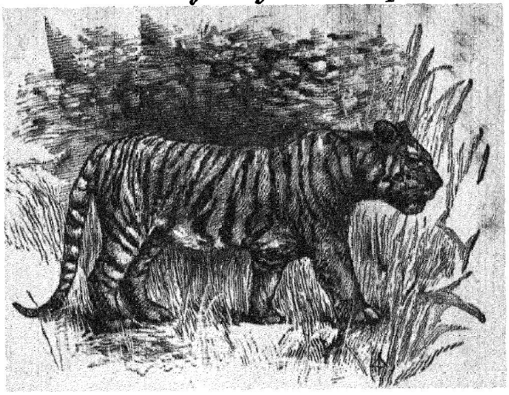


Fig. 152.—Tiger.

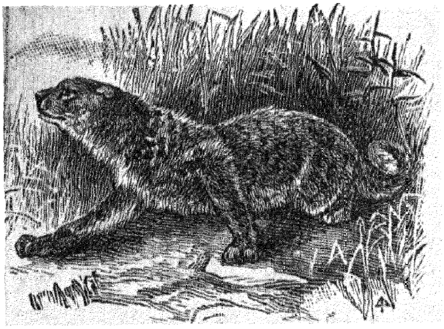


Fig. 153.—Cheetah or Hunting Leopard.

The *Tiger* is found iefly in India, Indo-China, and China. It is as strong as the lion and as fierce. Some tigers live only in the jungle and kill deer. Others wander out into the open country at night and kill the cattle of the villagers. And a few tigers known as "man-eaters" kill men and are the dread of many villages. arge rewards are offered y Government to shikaris shoot them. Even the ger is of some use, however, for it kills large umbers of deer which ome into the fields of the llagers in lonely parts of e country at night and at the crops.

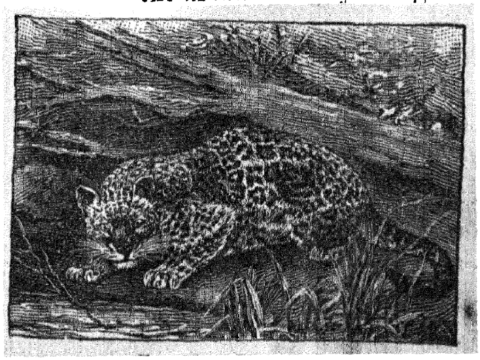


Fig. 154.—Panther.

The *Leopard* or *anther* is smaller than the tiger but is just as fierce. It limbs trees, and often springs on a deer from a branch of a tree. It wanders into villages and kills cattle and goats and dogs and donkeys.

One kind of leopard is more like a dog than a cat, for it cannot draw back its claws fully. It is known in Europe as the Cheetah or Hunting Leopard. The word *cheetah* means "spotted," and in India is used for the Panther as well. These hunting leopards are tamed and are trained to hunt deer. They are kept in cages and taken about in carts. When the hunters see a deer they show it to the leopard, which runs after it and kills it.

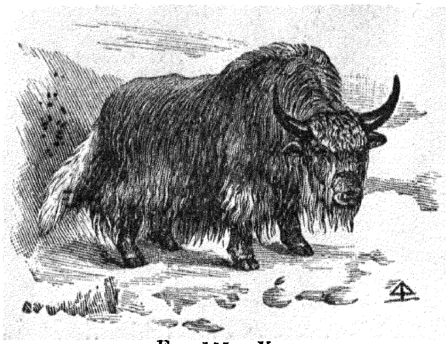


FIG. 155.—YAK.

Wild Oxen.—The chief of these are the Yak and the Bison.

The *Yak* is found wild in Tibet, but is often tamed by the Tibetans who ride yaks instead of horses, for their country is too cold for horses to live in. They also use them for carrying goods. They have sharp hoofs, and can climb the steepest hillsides. They are found at heights of 20,000 feet.

The *Bison* is found in very dense jungles in the Western Ghats in India. It stands nearly six feet in height at the shoulder, and is very strong and is not afraid even of the tiger. It has very large horns and a very thick hide. Bisons are always found in herds. (See American Bison on p. 471.)

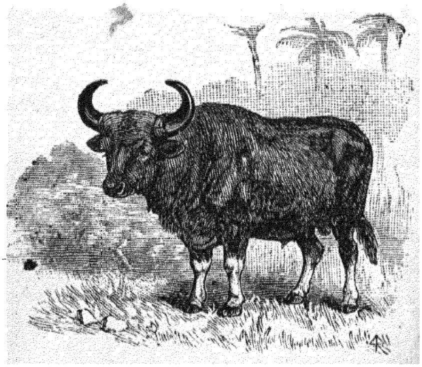


FIG. 156.—INDIAN BISON.

Wild Goats.—*Deer* belong to the goat tribe. There are many different kinds of them in Asia. Nearly all of them, but the reindeer, are found in India.

The *Sāmbhar* is the largest. It has thick branching horns, and lives in thick jungles on the hills. It very seldom comes down into the plains. It is found in all the hill forests in India.

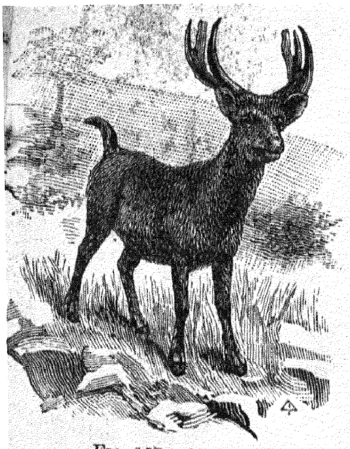


FIG. 157.—SAMBHAR.

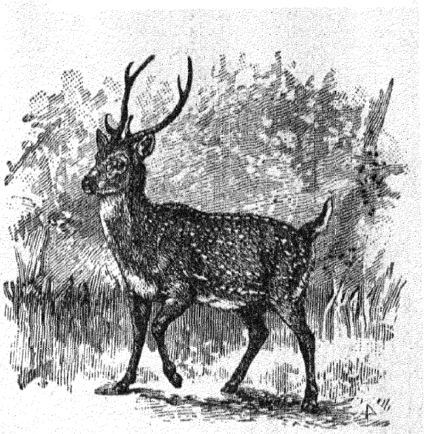


FIG. 158.—SPOTTED DEER.

The *Cheetal* or Spotted Deer is a very pretty animal, which lives in open wooded country in the outskirts of the jungle. It is often tamed and kept in p

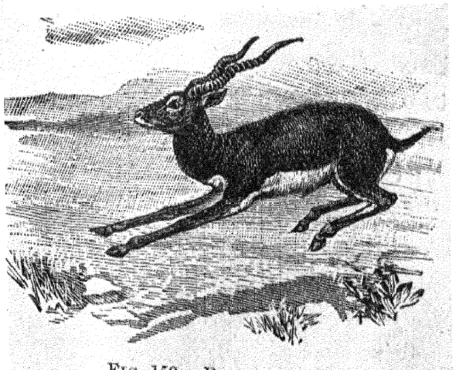


FIG. 159.—BLACK-BUCK.

The *Black-buck* is an antelope[1] which is found in open fields and wide plains. It is the fastest of the wild-goat tribe, and moves over the ground in long bounds of 20 feet at a stretch.

The *Ibex* is found only on lofty mountain peaks. It goes about in small herds, and while the herds graze an old buck is always posted on a high peak to see that no enemy comes near. The ibex has two horns slanting backwards, and often 4 feet in length. It is found in Kashmir and other Himalayan countries. (For the *Reindeer*, see page 428.)

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[1] For the difference between Deer and Antelope see p. 383.

FIG. 160.—IBEX.

The *Elephant* is the noblest, the largest, and the strongest of all the dwellers in the jungle. It is found wild in large herds in India and in Assam. From the earliest times the elephant has been tamed, and is of great use to man for carrying timber and other weighty things, and for riding. It is now used on State occasions by Governors and Maharajahs and Nawabs. It was formerly used also in battle. There are two kinds of elephants, the Indian and the African. (For description of the latter see p. 384.)

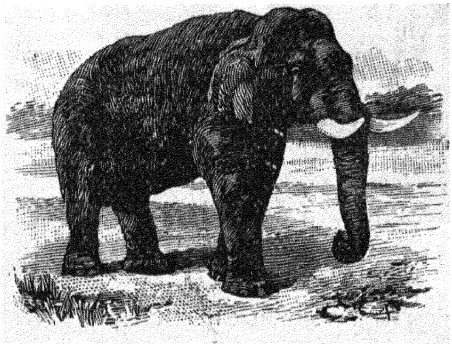


FIG. 161.—INDIAN ELEPHANT.

Camels.—There are two kinds, one with one hump only and the other with two. The species with two humps is known as the Bactrian. It comes from Turkestan and Central Asia. The Arabian Camel has only one hump. The hair of the Bactrian is thicker and coarser than that of the other. A thick woollen felt (numdah) is made from it

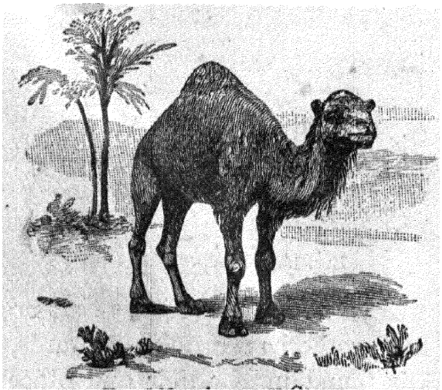


FIG. 162.—ARABIAN CAMEL.

The Camel is called the "Ship of the Desert." It has broad flat hoofs that spread out, so that it can walk easily over sand. The camel can live on coarse bushes and thorny shrubs, and go many days without drinking water.

Bears.—There are many kinds of bears, black and white and brown. Only the black bear is found in India. It lives in the hills, in caves, and comes out at night to feed. It eats fruit and twigs and roots and wild honey. It has long sharp claws and climbs trees easily.

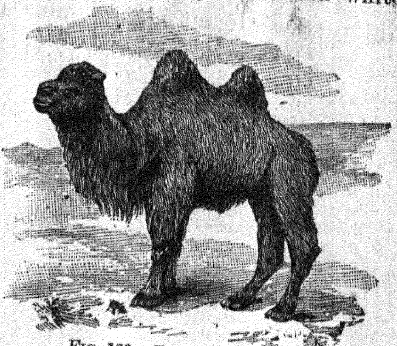


Fig. 163.—Bactrian Camel.

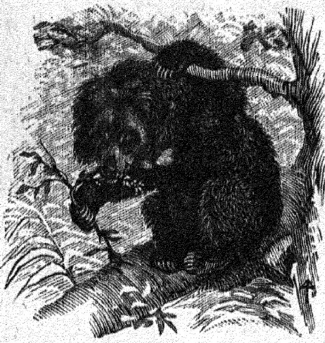


Fig. 164.—Indian Black Bear.

The Rhinoceros.—There are two species, one known as the Indian, which has one horn, the other, the African, which has two horns. The Indian Rhinoceros is found chiefly in the swampy parts of the great grass jungles of India. It is, of land animals, next in size to the elephant, standing 5 feet at the shoulder. It has very thick folds of skin which cover it like plates of armour. It feeds on the roots of trees and grasses. (See picture of African Rhinoceros on p. 385.)

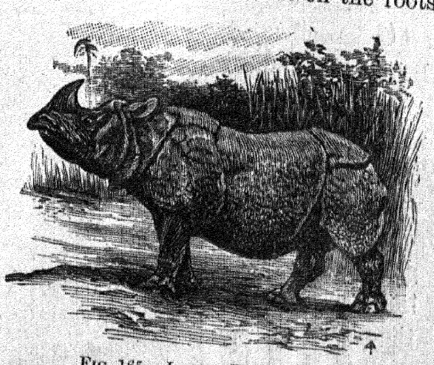


Fig. 165.—Indian Rhinoceros.

Wild Dogs. — Belonging to the Dog tribe are the *Wild Dog*, which goes about in packs in the jungle; the *Hyena*, also found in many parts of India; the *Wolf*, not very common; and the *Jackal*, which every one who has lived in India has seen and heard, for it is found in every part of India. It is a very useful little animal, for at night it prowls about the streets of large towns in India and Asia Minor, and eats up all the offal that may have been thrown down, and so keeps the streets clean. Jackals also eat up any dead animal that they may find in the fields.

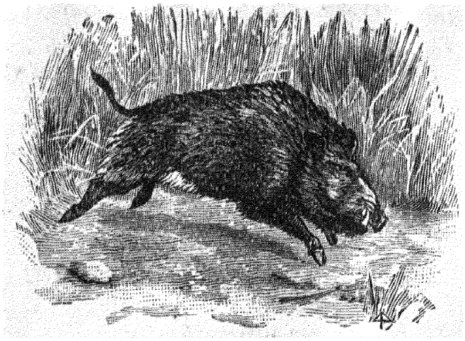


FIG. 166.—WILD BOAR.

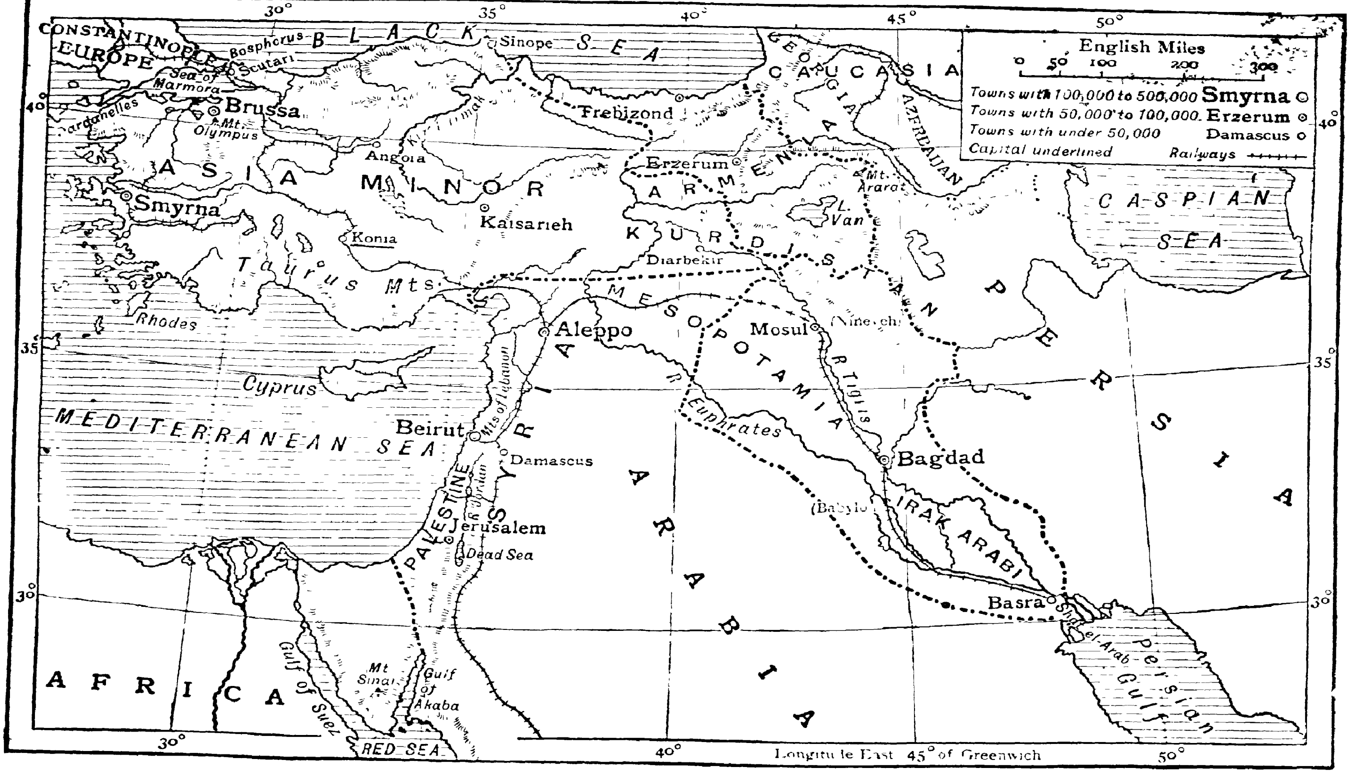
The *Wild Boar* is a wild pig. It is found in the wilder parts of Europe as well as in parts of Asia, especially in India, where it is hunted by sportsmen on horseback with long spears. It is a very fierce animal, and with its long teeth or tusks can easily kill a man.

63. TURKEY IN ASIA.

THE peninsula long known as **Asiatic Turkey** includes Asia Minor, or Anatolia, Syria with Palestine, Mesopotamia, Kurdistan, and Armenia. But the only part now under the rule of Turkey is Anatolia, with Smyrna the great port of the country. Mesopotamia (or Iraq), Palestine, Syria, and Kurdistan are independent states, the two first being under the control of Britain and the third under that of France.

Asia Minor, also known as Anatolia, is a plateau which rises on the south into the Taurus Mountains (10,000 feet). The chief river is the Kizil Irmak (800 miles), which flows northwards into the Black Sea. On the plateau wheat grows well, and herds of cattle and goats are reared. The Angora goat has hair called mohair, which is soft, fine, and silky. Shawls and carpets are made out of it. Anatolia is the best of the provinces and the most largely peopled, having a population of about 10 millions.

TURKEY IN ASIA



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Smyrna (375), a great port on the Ægean Sea, is the largest town in Asiatic Turkey. It has great trade, being the outlet for the produce of Asia Minor. **Brussa** (110), a very ancient town at the foot of Mount Olympus, has large silk manufactures. **Scutari** (80), a port on the Bosphorus, is opposite to Constantinople. **Angora** (347) is now the capital of Turkey. **Trebizond** (55), a strong fort on the Black Sea, is the trade outlet of northern Persia. **Sinope**, on the Black Sea, has a good harbour, the best on the coast. **Kaisariah** (54) is the most important trade town on the plateau.

Cyprus, a large island on the Ægean Sea, belongs to the British. The inhabitants are Greeks.

Syria and Palestine.—The mountainous strip of country lying along the coast of the Mediterranean Sea is called Syria in the north and Palestine in the south. On the coastal plain the climate is mild and pleasant, and all fruits grow well. The eastern country is the Syrian desert, which is a part of the great Arabian desert. In Palestine the little river Jordan flows into the Dead Sea, a salt lake whose surface is about 1300 feet below sea-level, being the lowest part of Asia. The mountains of Lebanon (10,000 feet) run along the west of Syria. The products are silk, tobacco, oranges, and olives. Wheat grows on the plains.

Damascus (250), a very ancient city on a well-watered plateau, among gardens of roses and orchards of fruit, is a centre of inland trade, and manufactures sword-blades which are famous everywhere. **Aleppo** (250), another large inland centre of trade, is connected by rail with Damascus.

Beirut (180) is the chief port of Syria. **Jerusalem** (64), the capital of Palestine, is the Holy City of Jews and of Christians. Here Jesus Christ, the Founder of Christianity, lived and died.

ARMENIA AND KURDISTAN

are plateaus and highlands, 4000 to 7000 feet above sea-level. The volcanic peak of Ararat, snow-capped, rises 17,000 feet above the sea in this region. On the plateau is the salt-water lake Van, 5000 feet above the sea. The climate is extreme. In the valleys grow grain, fruit, cotton, and tobacco. The Armenians are Christians. The Kurds are Muhammadans, most of them being robber tribes. **Erzerum** (80) is the capital of Armenia. Through it passes the trade between the Black Sea and Persia to Trebizond. which is its port.

MESOPOTAMIA[1] (IRAQ)

is the country between the Euphrates (1800 miles) and Tigris (1100 miles), and is filled to an unknown depth with the alluvium or silt brought down from the hills by these rivers. The soil is very fertile, and great nations and mighty empires flourished here in ancient times. Nineveh and Babylon were famous cities 3000 years ago, where their ruins may now be seen as heaps of dust. In those days the whole country was well irrigated. The country was laid waste by the Arabs in the seventh century and never recovered. Canals are now being made by British engineers, and no doubt great cities will once more arise. **Bagdad** (250), once the capital of the Caliphs, with 2 millions of inhabitants, is still an important town and a centre from which caravans start. **Mosul** (350), on the Tigris (near ancient Nineveh), gave its name to *Muslin*, once manufactured here largely. **Basra** (165) is on the Shat-el-Arab, the junction of the Euphrates and Tigris. It is the great port of Mesopotamia. Steamers sail up to Bagdad.

64. ARABIA.

ARABIA, the largest peninsula in the world, is a huge tableland about 3000 feet high, surrounded by ranges of mountains. The greater part of it is a desert lying north and south of the Tropic of Cancer. This desert is very much like the great desert of Africa in the same latitude, being separated from it by the Red Sea, which is too narrow to affect the climate.

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[1] Greek *Mesos* = middle, *Potamos* = river.

Western Arabia is bounded on the east by a long range of mountains, rising in the south to 10,000 feet. The northern half is the province of Hedjaz, the southern is Yemen. The former is a hot, dry, barren land, known as the Tchama; the latter is a rich and well-watered country, with a moderate climate and fair rainfall. The coastal plain is reached by the moist winds from the Indian Ocean. Grains and fruit grow well. Various sweet-smelling gums, *e.g.* frankincense and myrrh and balsam, are products of Yemen. It was the first home of coffee, and the coffee of Mocha was considered to be the best in the world. More people live here than anywhere else in Arabia.

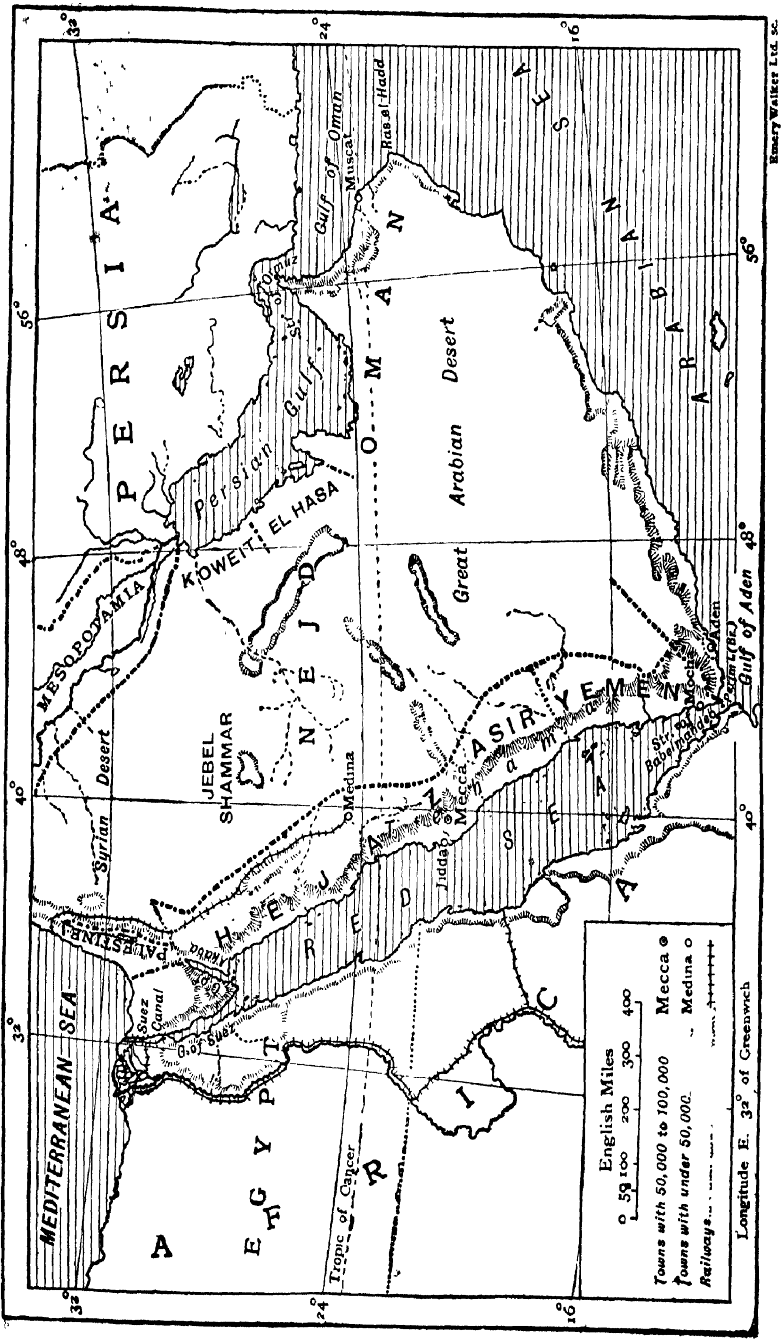
Hedjaz is ruled by its own King, with his capital at Mecca. He is in charge of the holy cities, Mecca and Medina. The country was for centuries under Turkey. But in 1916 the Grand Sheriff or Emir of Mecca declared himself an independent ruler, with the title of the King of Hedjaz, with his capital at Mecca. The Sultan of Turkey acknowledged his independence. He wields great influence throughout the Muhammadan world, because he is in charge of Mecca. **Yemen** is ruled by its Imām.

The rest of the country is divided between Arab Sheikhs, or chiefs, each at the head of a tribe. Those who live in the desert are called Bedouins. They wander from place to place with their tents, their camels, and their horses looking for pasture. The only part of the country (besides Yemen) where the land can be cultivated is Nejd, in the interior. Here there are many oases, where date-palms flourish and the finest of the Arabian horses, camels, and donkeys are bred.

Mecca (70) is the holy city of Islam. Thousands of Muhammadan pilgrims come to it from all parts of the world. **Jiddah** (20) is the port of Mecca, 70 miles inland, on the Red Sea. **Medina** (10) is also a holy city, for here the prophet Muhammad was buried.

The chief products of Arabia are horses, camels, and dates. The population is supposed to be about 5 millions, nearly all Arabs (Muhammadans).

ARABIA


PERSIA
MESOPOTAMIA
Syrian Desert
PALESTINE
MEDITERRANEAN SEA
Suez Canal
G. of Suez
G. of Akaba
Akaba
EGYPT
AFRICA
Tropic of Cancer
RED SEA
HEJAZ
Medina
Mecca
Jidda
ASIR
YEMEN
Mocha
Aden
Perim I. (Br.)
Str. of Babelmandeb
Gulf of Aden
JEBEL SHAMMAR
NEJD
KOWEIT
EL HASA
Persian Gulf
Ormuz
Str.
Gulf of Oman
Muscat
Ras el Hadd
OMAN
Great Arabian Desert
ARABIAN SEA
32°
24°
16°
40°
48°
56°
English Miles
0 50 100 200 300 400
Towns with 50,000 to 100,000 Mecca ●
Towns with under 50,000 " Medina ○
Railways
Longitude E. 32° of Greenwich
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Oman, in the south-east, is a large independent State, extending along a coast-line of about 1000 miles, with a population of half a million. The capital city is Muscat, which is a port with some trade with India.

Aden (55), a strongly fortified port belonging to the British, stands at the south-western corner of Arabia, and, with the little island of Perim (also a British possession), commands the entrance to the Red Sea. It is a coaling station for steamers. one of the most important in the world.

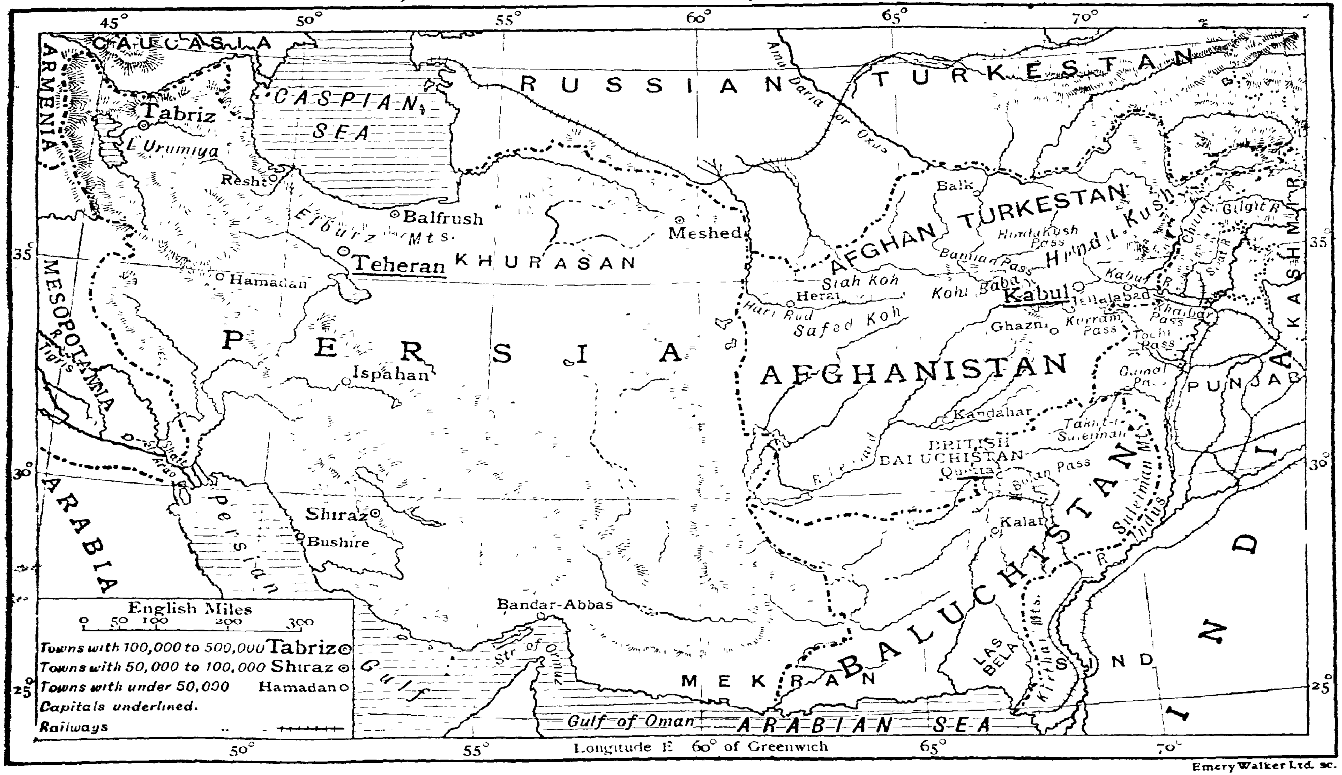
65. PERSIA.

PERSIA is the western part of the large table-land of Iran, of which the average height is from 3000 to 5000 feet. On the north the Elburz Mountains, which rise to 19,000 feet, shut out the moist breezes from the Caspian Sea. Several other high ranges run across the centre and south of Persia, and prevent the rain-bearing winds from the Indian Ocean from reaching the interior of the country, which is thus a dry and barren country. The extremes of heat and cold from day to night and from summer to winter have made more than half Persia into an arid sandy desert. There are no large rivers. In the north-west there is the very salt and shallow lake Urumia, nearly 5000 feet above sea-level.

In the valleys of the Elburz, particularly those of the northern slopes, towards the Caspian Sea, there are many fertile valleys, with gardens and fields in which wheat, barley, rice, fruits, such as grapes, figs, and melons, are grown. The mulberry is cultivated and much silk is produced. Other valuable products are opium, cotton, and wool. Persian carpets are well known, and Persian turquoises. Rich petroleum wells have lately been worked.

The population is very sparse, and is supposed to be about 9½ millions. The Persians are nearly all Muhammadans of the Shia sect. The government until 1906 was an absolute monarchy under a Shah. There is now a nominal Majlis or National

PERSIA, AFGHANISTAN, BALUCHISTAN.



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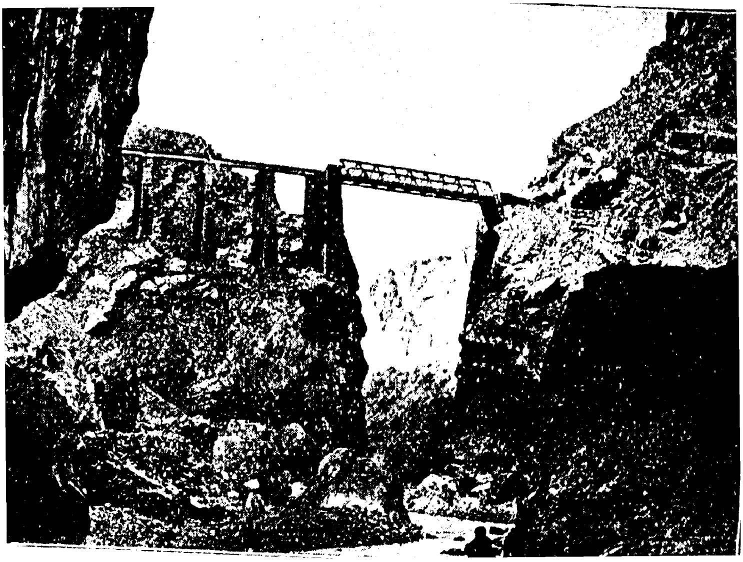
Council. The government is carried on by a Cabinet of Ministers.

Teheran (220), the capital, is on a riverless plain at the foot of the Elburz Mountains. **Tabriz** (200), the commercial capital, 5000 feet above the sea, is on the trade-route to Trebizond. **Ispahan** (80), the former capital of Persia, on a fertile plain, is second only to Tabriz in trade. **Mashad** (75), in the north-east, the capital of the province of Khurasan, is the chief trade centre of eastern Persia, and a holy city of the Shias. **Shiraz** (50), 4500 feet above the sea, is celebrated in Persian poetry for its roses, wine, and bulbuls. It is the home of the purest Persian language. **Bandar Abbas** and **Bushire** are ports on the Persian Gulf which trade with India and other countries.

66. AFGHANISTAN.

AFGHANISTAN, the loftiest part of the table-land of Iran, with an average elevation of from 4000 to 7000 feet, rises into the Hindu Kush Mountains (20,000 feet) on the north and the Suleiman Mountains (7000 to 11,000 feet) on the east. The Hindu Kush extend westward into the Koh-i-Baba and then into the Siah Koh or Black Mountains and the Sufed Koh or White Mountains. To the north of these ranges lies a narrow tract known as Afghan Turkestan, divided by the Oxus from Russian Turkestan. Afghanistan is about 600 miles broad and 500 miles long. It is a "land of bare rocks, sandy wastes, sterile hills, and vast snow-topped mountain ranges." Here and there are found sheltered valleys with fertile fields, vineyards, and orchards. There are great extremes of climate; in summer, scorching heat under the fierce blaze of the sun; in winter, bitter cold with frost, ice, and storms of snow. The fields are irrigated in many places by channels dug from wells or small rivers. The chief rivers are, in the north the Hari Rud, and in the south the Helmund; both drain inwards. In the sheltered valleys fruits flourish, *e.g.* the grape, fig, pomegranate, apple, pear, peach, plum, cherry, almond, and mulberry. The crops rown are rice, millets, maize, and castor oil; the manufactures nclude silks, felts, carpets, and postins or sheep-skin coats.

The government is an absolute monarchy under an Amir, hose decrees are law. The population is uncertain, but is upposed to be about 6 million. There are various races and tribes of Afghans, all of them being Muhammadans of the unni sect. The languages are Persian and Pushtu. The Amir an ally of the British, who assist him with a subsidy.



. 167.—Chuppar Rift Bridge, Sind Peshin Railway, on the road to Quetta.

Kabul (150) is about 6000 feet above the sea, 165 miles st of Peshawar. The Kabul River flows through a deep rge in the mountains, forming the Khaibar (Khyber) Pass, into Punjab. Caravans go down this pass with goods for India. **rat** (20), in a fertile plain watered by the Hari Rud, is the st important town in the north-west. **Kandahar** (32), the gest town in the south, has trade with India by the Bolan ss. **Ghazni**, a little to the south of Kabul, was the capital the days of Sultan Mahmud.

67. RUSSIA IN ASIA.

THIS great country includes three divisions—Caucasia, Siberia, and Russian Turkestan. Caucasia includes three independent republics, viz. Caucasia, Georgia, and Azerbaijan. (See p. 457, and map on p. 351, and coloured Map 16.)

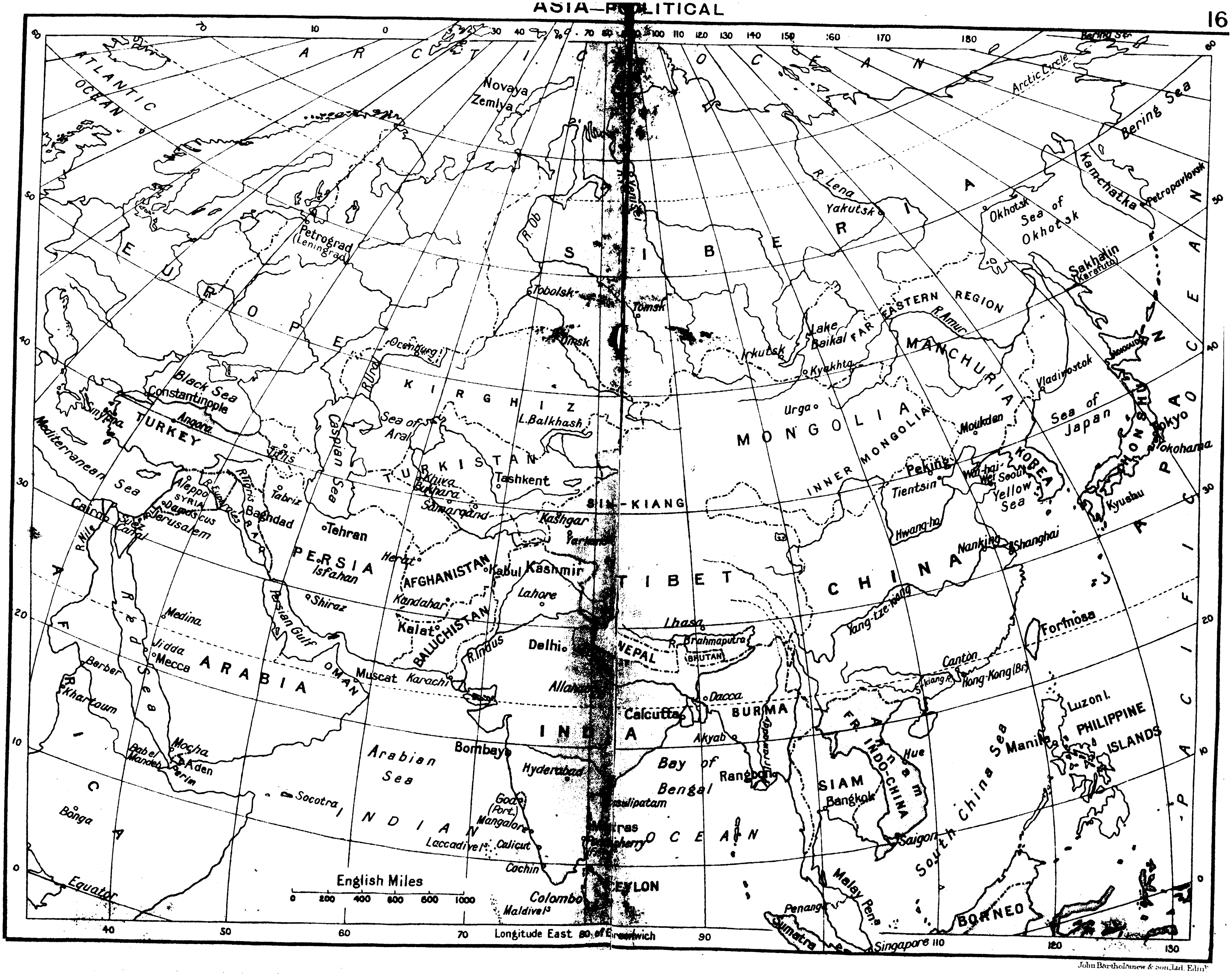
CAUCASIA,

the land of the Caucasus, is the country between the Black Sea and the Caspian. The great range of the Caucasus runs through it for about 750 miles. The highest peak, Mt. Elburz, rises to 18,500 feet, far above the snow-line. It has magnificent forests, and in the river valleys on the south, which are warmer and have more rain than those on the north, grow rice, wheat, maize, and fruits of many kinds. Many rivers from 500 to 800 miles long flow down from the mountains into the Caspian and the Black Sea. In the mountains are found gold, copper, coal, and salt, but the most important product of this country is *Petroleum*, or kerosene oil, which is obtained in enormous quantities from wells near Baku on the Caspian. Caucasia is second only to the United States in its yield of petroleum. The population of the province is about 13 millions. Tiflis (307), at the foot of the southern slope of the Caucasus, is the capital. It stands about midway between the two seas and is connected by rail with the two ports of the country, **Baku** (250) on the Caspian, and **Batum** (45) on the Black Sea.

SIBERIA,

the northern, and by far the largest and least populated province of Asiatic Russia, consists of vast plains, stretching from the Caspian Sea to the Arctic Ocean and sloping generally upwards from south to north, as may be seen on the map by the course of the rivers. These plains rise on the south-east into a plateau of which the eastern edge is formed by the **Stanovoi** (Backbone) mountains and the **Yablonoi** (Apple-tree) mountains which

ASIA—POLITICAL



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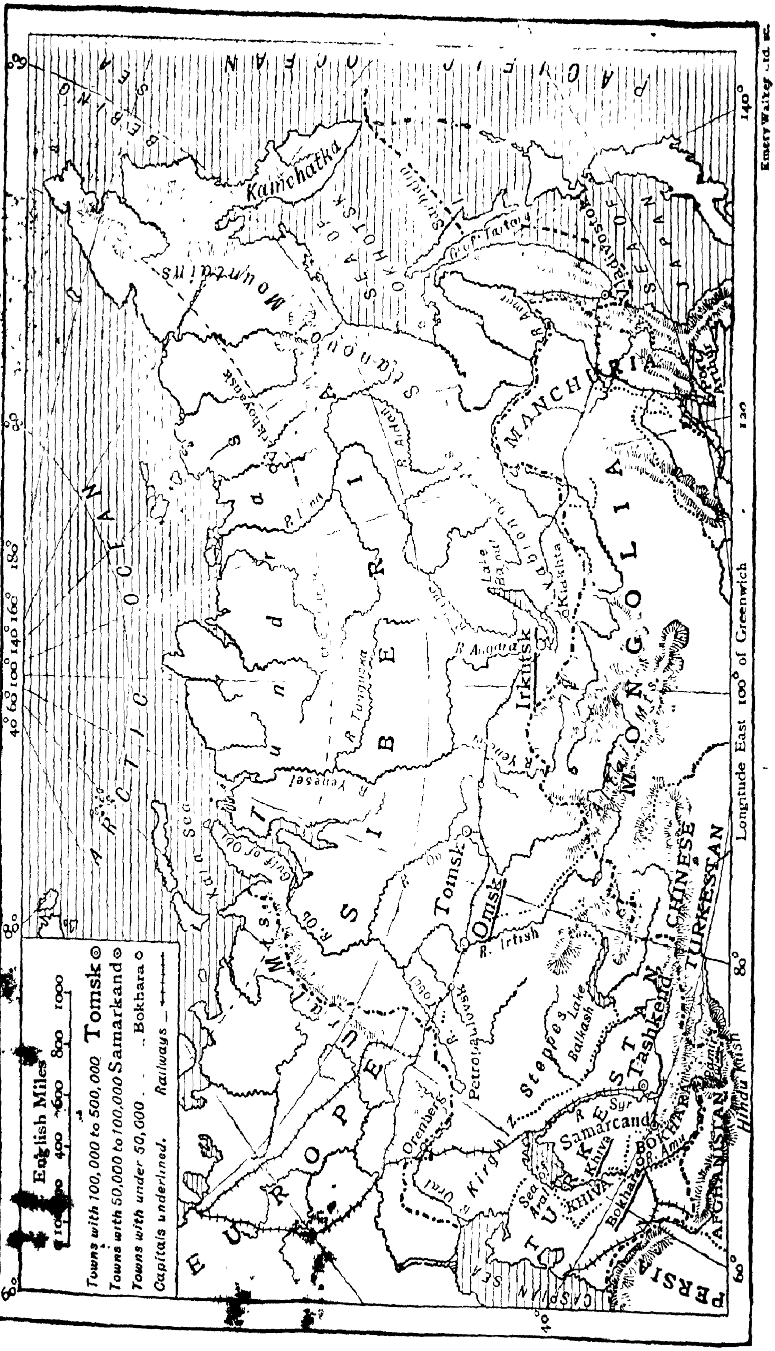
RUSSIA IN ASIA



extend for 2500 miles up to the Bering Sea, and reach a height of 6000 to 10,000 feet. The **Mountains of Kamchatka** are a mighty volcanic range which rise to 16,000 feet, and include a dozen active volcanoes.

Three great rivers, among the longest in the world, flow northwards from the Central Asia plateaus, where they rise, across the Siberian plains into the Arctic Ocean. They are the **Ob** or **Obi** (3200 miles), with its tributary the Irtish; the **Yenesei** (2900 miles), with its tributary the Angara; and the **Lena** (2800 miles). Owing to their great length and the very gentle slope over which they flow, these rivers are very slow. They are frozen in winter, and their lower courses are through wide marshes of Tundra land.

The Angara flows through **Lake Baikal**, the largest fresh-water lake in Asia, and the deepest in the world, being over 5000 feet in depth. The **Amur** (2700 miles) flows eastwards, through mountainous country and plateaus, into the Pacific Ocean.

The most important trade highway in all northern Asia is the **Trans-Siberian Railway**, about 5000 miles long, which leads from Europe across Siberia to the Pacific Ocean. It is one of the great railways of the world, being the shortest and quickest route from Europe to China and Japan.

The climate of Siberia is everywhere extreme, and the extremes of cold and heat increase in severity as we go eastward. The country around Verkhoyansk in the north-east is the coldest place on earth (see p. 342). The forests are very thick. The products of the north are the furs of the seal, the Arctic fox, and the ermine. The rivers yield abundance of fishes. In the clearings in the forests, in the south, much grain is grown, chiefly wheat, and there are dairy farms where butter is made for export to Europe. Great herds of cattle are kept on the green steppe-lands. Minerals include gold and coal in the mountains. The population of the whole of Siberia is about 10 million, wide tracts being very thinly peopled.

Tomsk (114), on the Obi, has the only University in Siberia. **Omsk** (137), on the Irtish, the capital of W. Siberia, is in the centre of the green steppe-land. **Irkutsk** (93), on the

Angara, is the largest town in E. Siberia, and has much trade with Kiakhta. **Vladivostock** (91), meaning "Rule the East," was so named because the Russians thought it would command all the trade of the Pacific Ocean, on which it is situated. It is a rising town and a terminus of the Trans-Siberian Railway.

RUSSIAN TURKESTAN

(see coloured Maps 15, 16)

is a land of steppes. In the north are three great salt-water lakes—the Caspian Sea, the Sea of Aral, and Lake Balkash. They all lie in a vast hollow, once the bottom of an ocean, and now known as the Aralo-Caspian depression, or the Plains of Turan (see Map 15). All the north of the country is dry steppe-land and desert. The valleys and slopes of the mountains in the south are well watered and fertile and afford good pasturage. Two great rivers rise in the mountains in the south and flow northwards across Turkestan. They are the **Amu-Darya** or **Oxus** (1300 miles), which flows into the southern end of the Sea of Aral, and the **Syr-Darya** or **Jaxartes** (1150), which flows into the northern end of the Sea of Aral. In the far north the **Ural** (1300), which rises in Europe, flows across the steppe into the Caspian Sea. The climate is dry and cold. Icy winds blow down from Siberia, through the Aralo-Caspian gap, for there are no mountains to stop them. The products in the southern valleys are wheat, rice, cotton, and fruits, including melons, pomegranates, apricots, peaches, apples, and pears. On the pasture-lands good horses, cattle, and sheep are bred.

Turkestan, the land of the Turks, was the native home of the Mogul Emperors of India. Babar, the first of the Moguls, was at first the chief of a Turkish tribe. The chief tribes are the Kirghiz in the northern steppes, and the Usbegs and Turkomans in the south. The total population is about 7¼ millions, all Muhammadans. Turkestan is now a part of the Russian Empire. It includes two large protected states—**Khiva**, under a Khan, and **Bokhara**, under an Amir—both under Russian control.

Tashkend (272), the Russian capital of Turkestan, is connected by rail with Europe. **Samarcand** (95) was the ancient capital of Timur, the ancestor of Babar who once ruled this city. In it is the tomb of Timur. **Khiva** (5), the capital of the State, is now a very small town. **Bokhara** (75), the capital of the State, is a large town with much trade and exports of raw silk. It is on the Trans-Caspian Railway.

68. CHINA.

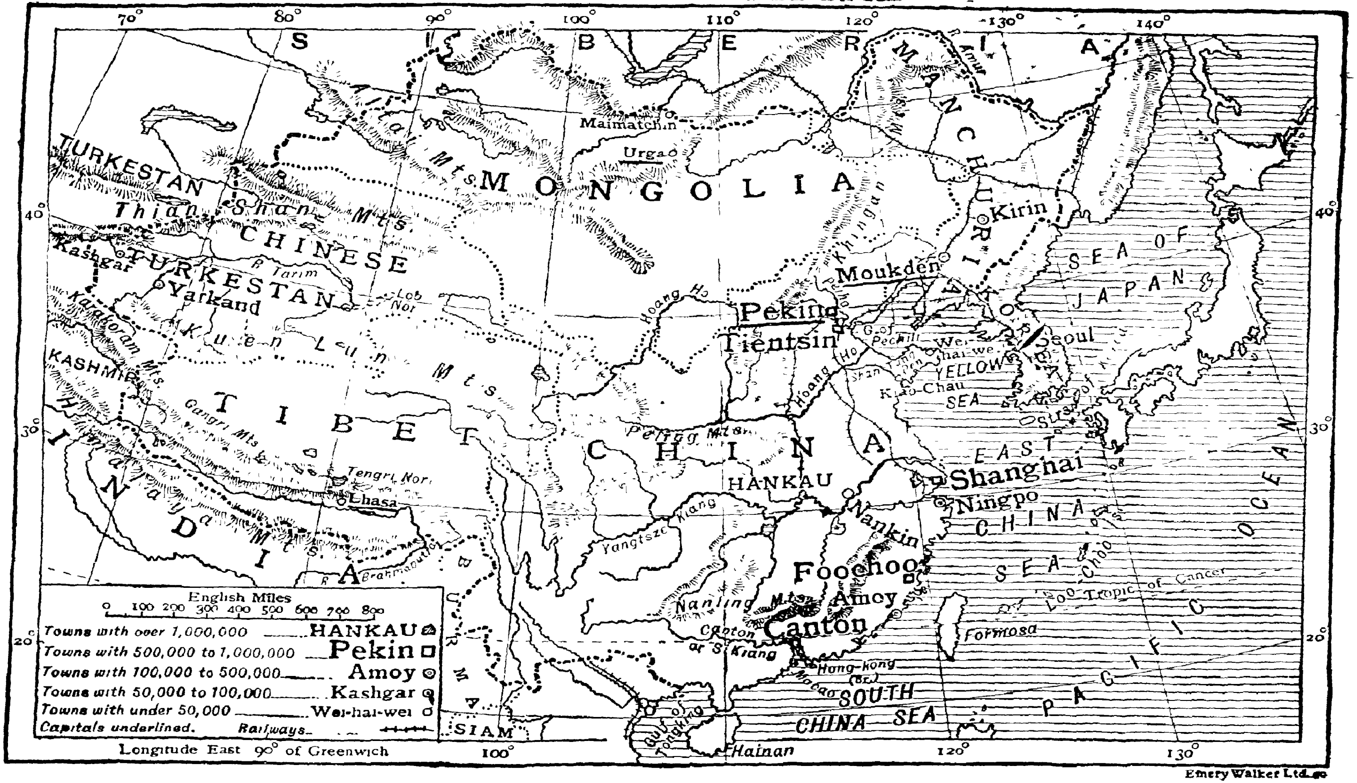
THE Chinese Empire is, after the British and Russian Empires, the third in the world in size; while, as regards population, it stands second with about 400 millions. It includes China proper, Manchuria, Mongolia, Chinese Turkestan, and Tibet. This "oldest of monarchies" became a Republic in 1912, under a President, Vice-President, and Council of State. The people all belong to the great yellow race of mankind, the Mongolian (see Lesson 61). The flag of the new Republic has five stripes—Red, Yellow, White, Blue, and Black—to denote the five races of the Empire—Mongol, Chinese, Manchu, Tibetan, and Turki (Turkestan).

China (proper) is shut out from the rest of the world by the great mountain ranges of Central Asia and Tibet. To protect their land from invasion by the savage hordes of Central Asia, the Chinese, about 2200 years ago, built a wall 1600 miles long, which separates China from Mongolia and Manchuria. It is known as the "great wall of China."

Northern China—the home of the Yellow man—is a rich and fertile land. The plains are filled with yellow alluvium brought down by the great yellow river Hoang-ho, the mountain valleys are filled with yellow soil called *loess.*

The *East* is one wide plain about 700 miles long and 400 miles broad. It has been formed by the silt brought down by the **Hoang-ho** (2500 miles long). This river rises in Tibet at a height of 14,000 feet, and is so shallow and so rapid that it is of scarcely any use for navigation. It has often flooded the surrounding plains, and has changed its course at least

CHINESE EMPIRE



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eleven times, flowing sometimes into the Yellow Sea and sometimes into the Gulf of Pechili, now north and now south of the Shantung peninsula. On one occasion over a million of people were drowned in one of these floods, and the river is therefore called "China's sorrow." The *West* of northern China consists of mountain valleys filled, in some places to a depth of 1000 feet, by yellow *loess* soil. This is dust which has been blown over, by strong winds, from the Gobi or great dry sandy desert of Mongolia. The rich plant-food in this dust had not been washed out of it by rain or exhausted by growing plants; this is why it is so fertile. The valley of the little river **Pei-ho**, north of the Hoang-ho, is also very fertile.

Southern China includes a plain—much smaller than that in the north—watered by the Yang-tse-Kiang, in the east; and a mass of mountains in the west, the main chain being the **Nan-ling** mountains. The **Yang-tse-Kiang** (3200 miles) is one of the longest rivers in the world. It rises in Tibet not far from the Hoang-ho, the Peling Mountains dividing the basins of the two rivers. It is the one great inland waterway of China, being navigable for a longer distance than any other river in the world through a densely peopled country. Large vessels can sail up its course for about 600 miles to Hankow, and smaller vessels to about 1000 miles. It has numerous tributaries.

The **Si-Kiang** River waters the southernmost plain of China, being divided from the basin of the Yang-tse by the Nanling range of mountains. At its mouth the great port of Canton has arisen. Large steamers sail up the river for a long way and bring down the produce of the valley to Canton.

The climate of China is extreme in the interior, maritime on the east coast. "All through the winter, dry, icy winds blow outward from the Gobi desert across China; all through the summer, warm, wet winds blow inward from the Pacific." It is a monsoon land, the summer rains coming as a south-east (not, as in India, a south-west) monsoon. The summers, warm and wet, and the alluvial soil make the great river plains very productive. Agriculture and fishing are the chief occupations of the people. The chief products are silk and tea. About

27 per cent of the world's supply of raw silk comes from China. The crops are wheat, the millets, barley, tobacco, and beans in the north; and tea, rice, the opium poppy, mulberries, sugar-cane, and cotton in the south. Nearly all the forests have been cut down to make room for fields. To make up for the want of timber, *bamboos* are grown in enormous quantities; all sorts of vessels and boxes are made out of them, and the leaves are plaited into mats. Minerals are not yet properly mined, but the largest coal-fields in the world are in China, and excellent iron, copper, tin, and gold. Tin is the chief exported mineral.

China has many large towns, six with over half a million and six more with over 100,000 inhabitants. Forty-six of its towns are "treaty ports" on the sea or on rivers.

The *State religion* is Confucianism, being the moral precepts compiled by the great sage Confucius from the ancient Chinese classics. It includes ancestor-worship and the highest reverence for all things ancient. Buddhism is mixed up with it everywhere.

Pekin (1300), the capital, is an ancient city built over 3000 years ago. It commands several routes into Mongolia and Manchuria.

Tientsin (838), at the mouth of the Pei-ho on the Gulf of Pechili, is the port of Pekin and the northern terminus of the Grand Canal, the great waterway of the interior, and the outlet for the produce of the fertile valley of the Pei-ho. **Hankow** (290), on the Yang-tse Kiang, the largest inland town, at the meeting of great waterways, is in the most densely peopled part of China. It is the greatest trade centre of the country. **Canton** (1367), at the mouth of the Si-Kiang, is a large port which is the outlet of the fertile valley of this river. **Shanghai** (1538), on the bay at the mouth of the Yang-tse, is the chief sea-port of northern China, the "gate" of the Yang-tse Valley, and the busiest of all the treaty-ports. Here is the chief arsenal of China. **Nankin** (902), on the Yang-tse, was once the capital of China. Silk making is the chief industry. **Amoy** (400), opposite the island of Formosa, has a very good harbour. **Ning-po** (2172) and **Foo-choo** (1491) are flourishing treaty ports on the sea.

Wei-hai-Wei is a fortified port and naval station belonging to the British on the Shantung peninsula, on the Gulf of Pechili.

Kiao-chau (227), another strong fort on the same peninsula, belonged to the Germans, from whom it was taken by the Japanese in 1914.

MONGOLIA

is the great region of table-lands in the centre of Asia. It has an average elevation of 3000 to 4000 feet, and is walled in by lofty mountain ranges. The climate is extreme. It is a land of dry steppes and deserts over which roam nomadic tribes of Mongols and Tartars with their felt tents, their horses and camels, and, where there is pasture, with herds of sheep. The town of **Urga** in the north is one of the few cities, and is the capital. It is a sacred town of the Buddhists.

MANCHURIA

lies on the north of China proper. The Khingan Mountains divide it from Mongolia. It is a hilly country, but it includes a part of the fertile valley of the Amur. The soil is very rich. Rice, wheat, beans, and the millets are the chief crops. The population is about 20 million. The chief town is **Moukden** (158), a large city and important railway centre. **Port Arthur**, a strongly fortified port, now belongs to Japan.

TURKESTAN (CHINESE)

lies between Mongolia and Tibet, and has a population of about 1,200,000, chiefly Muhammadans. Across it runs the lofty Thian Shan Mountains. To the north there are steppes and deserts. The southern part is the basin of the River Tarim, which flows into Lake Lop Nor. This part is sometimes called Kashgaria. Here the soil is fertile and cereal grains and fruits are grown. Jade is the best-known mineral. It contains two ancient and famous cities—**Kashgar** (50), the capital and chief centre of the caravan trade with Russia; and **Yarkand** (100), the centre of the trade with Tibet and Kashmir.

TIBET,

the highest of the great plateaus of the world, lies between the Himalaya and Kuenlun Mountains, and rises in many places to 16,000 feet. Across it runs a wide range known as the Trans-Himalaya or Kailas or Gangri Mountains, which are divided from the Himalaya by the deep river valley of the Indus and Brahmaputra. The whole country is bleak and mountainous, the climate dry and one of great extremes. As foreigners are strictly excluded, very little is known of the interior. In the valleys barley is grown, and on some of the warmer slopes fruits are cultivated. The chief beasts of burden are the yak and the sheep, which take the place of cattle. Wool is the only product. It is exported to India. The population is about 2 million. The people are Buddhists. The head of the state is called the Dalai Lama, the Buddhist high priest, who lives at **Lhasa**, the capital. Tibet is nominally under the control of China.

HONG-KONG,

a small island about 11 miles long and 2 to 5 miles broad, divided from the coast by a narrow channel half a mile wide, is a British Colony. The whole of the Kowloon peninsula on the mainland opposite has been leased to the British. There is a splendid harbour. Hong-Kong is strongly fortified, and is the chief naval station of the British in the China Sea. It commands the approach to Canton, 90 miles distant. The population of the whole colony is about half a million. **Macao**, at the mouth of the Canton River, is a small island belonging to Portugal.

69. JAPAN.

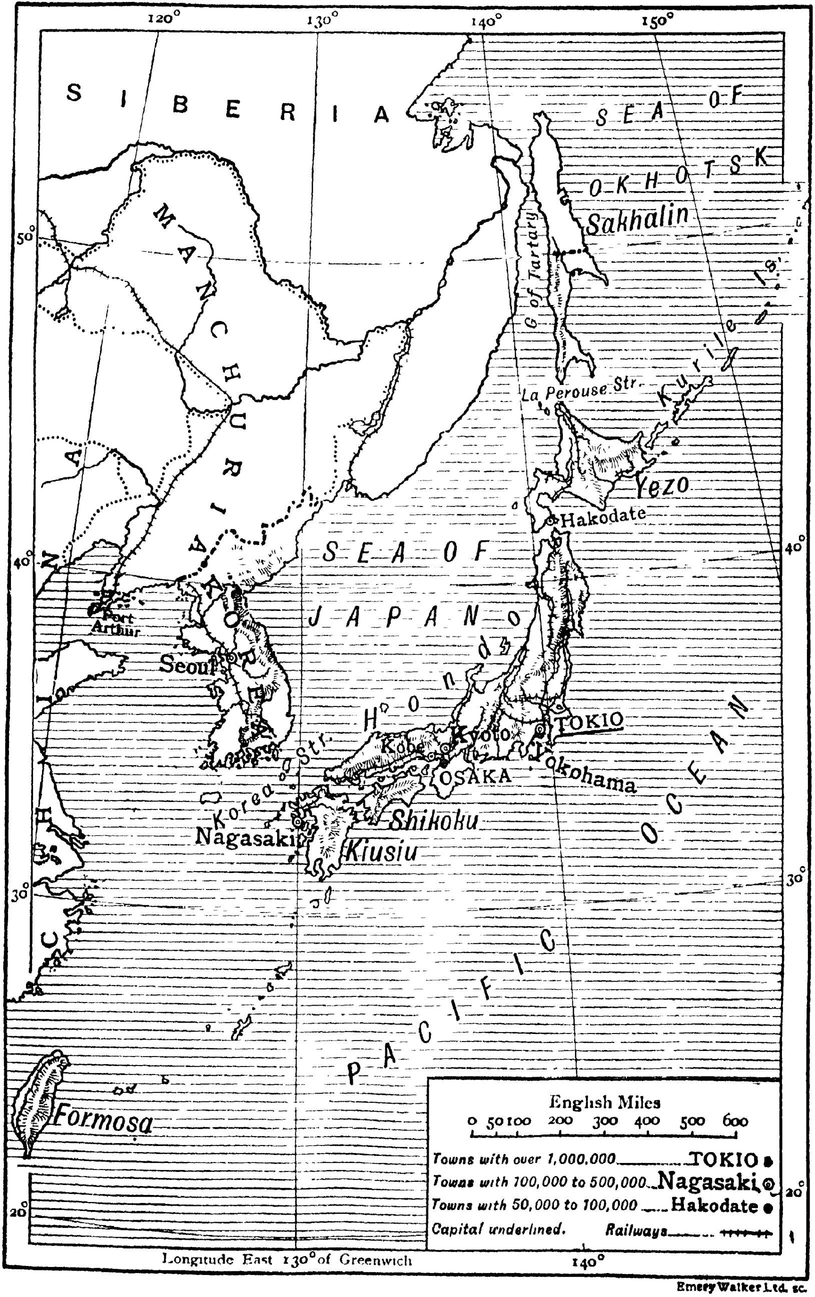
THE Japanese Empire includes the Kurile Islands, the Japan Islands, the Loochoo Islands, Formosa, and the southern half of Sakhalin. The most important of these are the three islands of (1) **Honshiu** or Hondo, which the Japanese call their mainland; **Kiu Shiu** and **Shikoko**. These may be considered Japan proper, and they alone send representatives to the Diet or Parliament. Hokkaido (or Yezo), Korea, and Formosa are ruled by governors, and with the other islands may be considered dependencies.

All these are volcanic islands. There are in them more than fifty volcanoes still active. The most famous is the beautiful snow-clad peak of **Fujiama** or Fuji-San (in Honshiu), over 12,000 feet high — the sacred mountain of the Japanese. Three-fourths of the islands are mountains. There is therefore little room for plains or lakes or rivers, but there are great numbers of rapid torrents which, although they are useless for irrigation and navigation, afford excellent water-power, as similar torrents do in Norway and Sweden. Abundant rain falls on the mountains, the mean annual rainfall being 58 inches.

The climate of Japan is, on the whole, insular, varying with the latitude, which stretches over 30 degrees. The other factors of the climate are (1)—the situation of the islands to the east of the vast land-mass of Asia, from which very cold winds blow over them in winter, making the air at that season cold and dry ; (2) a warm ocean-current called the **Kuro-shiwo**, which, like the Gulf Stream, carries the heated water from the equatorial sea northwards. On the other hand, an icy current from the Arctic Ocean makes the Kurile Islands to the far north intensely cold. The climate and insular situation of their country have made the Japanese what they are. The dry cold of winter makes them strong and hardy. The sea has converted them into a nation of sailors. Their coal, their iron, and their forests have given them a splendid navy and material for manufactures, which they have not failed to use.

The products are rice, which grows well in the damp, hot summer of the south, also cotton, tobacco, and the mulberry, which gives Japan its most valuable export, silk. On the slopes of the wooded hills tea is largely grown; other products are camphor, hemp, and beans. The fisheries in the surrounding seas furnish the fish, which is one of the chief articles of food of the Japanese.

JAPANESE EMPIRE



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Minerals are abundant. Its coal and iron mines have raised Japan to a first-class power and given it cheap railways. The country is also rich in copper, kaolin (the fine earth from which the famous Japanese porcelain is made), and sulphur (from which gunpowder and matches are manufactured).

The chief exports are raw silk, silk goods, cotton yarn, cotton goods, coal, copper, matches, tea, sugar, rice, and mats.

These islands are densely populated. The total population is about 77 million. There is one town with over 2 million of inhabitants, one with over 1 million, nine more with over 100,000, and twenty-four more with over 50,000. There is no *state* religion, the chief religions being Buddhism and Shintoism. Elementary education is compulsory. There are several universities. There is a very strong army and navy, service in one or the other being universal and compulsory for twenty years. Japan is governed by an emperor, who alone can make war or peace and conclude treaties, and has all the executive power, and makes laws with the consent of the Imperial Diet. In the Diet there are two houses, a House of Peers and a House of Representatives, the latter elected by the people.

Tokyo (2173) (in Honshiu), the capital of Japan, one of the great cities of the world, is a very busy manufacturing town, with many match factories and engineering works. Its port is **Yokohama** (423), the chief seaport of Japan, which has a splendid harbour and is the great centre for foreign trade. Its steamers visit all parts of the world. **Osaka** (1253), the second largest city (also in Honshiu), is on a beautiful sea called the Inland Sea. It is the centre of the rice and tea trade and large manufactures, chiefly of cotton. **Kioto** (591), the old capital, is the most beautiful town in Japan, with many palaces and temples. **Kobe** (609), the second seaport of Japan, is the outlet for the trade of Osaka and Kioto. **Nagasaki** (177), the chief town of Kiusiu, has a splendid harbour with large docks, and great shipbuilding yards and engineering works. Being near a rich coal-field, it is also a great coaling station for steamers. **Hakodate** (139), the chief town of Hokkaido or Yezo.

KOREA,

called **Chosen** by the Japanese, is a mountainous peninsula dividing the Yellow Sea from the China Sea. The mountain range, 6000 feet high, running down the centre, has many fertile valleys, in which rice, tea, sugar, the mulberry, cotton, tobacco, and beans grow well. The whole country, which had been an independent monarchy for centuries, was in 1910 annexed by Japan, and is now a province under a Japanese governor. The population (1921) is about 17½ million. The religion is much the same as in China.

Seoul (247) is the natural capital of Korea, for it stands where the chief river of the country crosses the centre of the long western slope of the mountains. It is now the centre of the railways. Its port is Chemulpo.

70. INDO-CHINA.

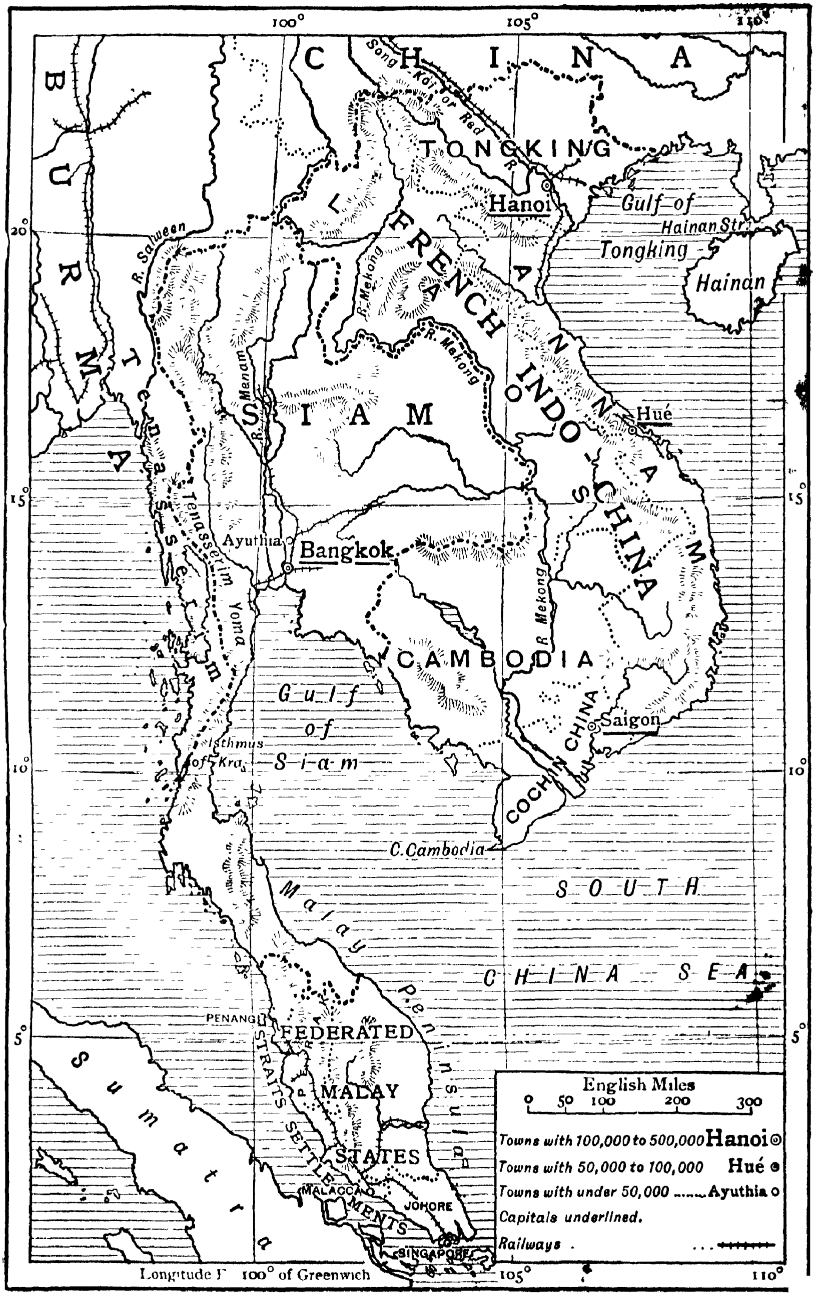
THIS large, south-eastern peninsula of Asia includes three countries, the Malay Peninsula, Siam, and French Indo-China.

THE MALAY PENINSULA

or Malaya (see Map 16), the land of Malays, is partly British territory (coloured red) and partly Siamese (coloured yellow). **British Malaya** includes—(1) the British Colony in the far south, known as the **Straits Settlements**, lying along the Straits of Malacca, which separate it from the island of Sumatra; and (2) the **Federated Malay States**, which are Native States, protected by the British.

The narrow isthmus of **Kra** divides the Malay Peninsula from Burmah and Siam. From this isthmus the peninsula runs southward for 700 miles. The land is a long line of mountains running up to 8000 feet with a narrow coastal plain on either side. The mountains are densely wooded. In them are found the elephant, tiger, bison, deer, and monkeys of many kinds. The climate is hot in the plains, but the heat is

INDO-CHINA



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lessened by the cool sea-breezes from the east and west. The temperature does not vary very much, being that of a maritime climate. The rainfall is heavy from both monsoons.

The products are those of a tropical land. Rice, cocoa-nuts, tapioca, and sugar-cane are the chief crops in the plains; and on the clearings on the slopes of the hills grow spices, rubber, pepper, and coffee. From the forests are obtained canes, bamboos, gutta-percha, oils, resins, and excellent timber. Minerals abound, chiefly tin, also gold, iron, copper, mercury, lead, silver, zinc, and coal. Three-fourths of the world's supply of tin come from these States.

The **Straits Settlements** include the islands of **Penang** and **Singapore**, and a long narrow strip of the mainland, called **Wellesley Province** and **Malacca**, opposite to them. They are a Crown Colony under a Governor and Council.

Singapore (423), on the island of the same name, at the far south of the peninsula, is the capital. It has a fine harbour, and being on the trade routes between India, Australia, China, and Japan, is a very important coaling station and port at which all steamers call. All the trade of the country is centred in Singapore; all the imports come to it, and all the exports go out from it.

The "**Federated States**" are four in number. Besides these, there are five states also protected by the British. The chief of them is **Johore** in the south.

SIAM

is the only independent kingdom in the peninsula, lying in the centre. It includes the whole valley of the **Menam**, which rises in the hills in the east of Burmah. The forests are filled with teak and other huge timber trees. The lower slopes are covered with bamboos. In the plains are groves of cocoa-nut and areca-nut palms and wide fields of rice, with tobacco and cotton. Siam is a monsoon land, the climate is hot, the rainfall from 60 to 80 inches.

The population is about 9 million. The country is ruled by a king who has a cabinet and a legislative council. There is no Parliament. Many British officers are employed under the government. Buddhism is the religion of the country. The chief exports are rice and teak, which is floated down the river to Bankok.

Bankok (93) is the capital. Many of the inhabitants live in boats. The port is shallow and only admits small steamers.

FRENCH INDO-CHINA,

the eastern part of the peninsula (see Map) includes the Protected States of Tongking, Anam, Laos, Cambodia, and the French colony of Cochin China. It comprises the basins of the Song-koi or Red River in the north and that of the Mekong in the south. The whole country is a monsoon land, and the climate is hot, damp, and unhealthy. The products are very much the same as those of Siam, being chiefly rice and after it sugar, spices, pepper, cotton, rubber, and salt fish. The minerals are coal and zinc. The population of French Indo-China is about 17 million, the religion chiefly Buddhism.

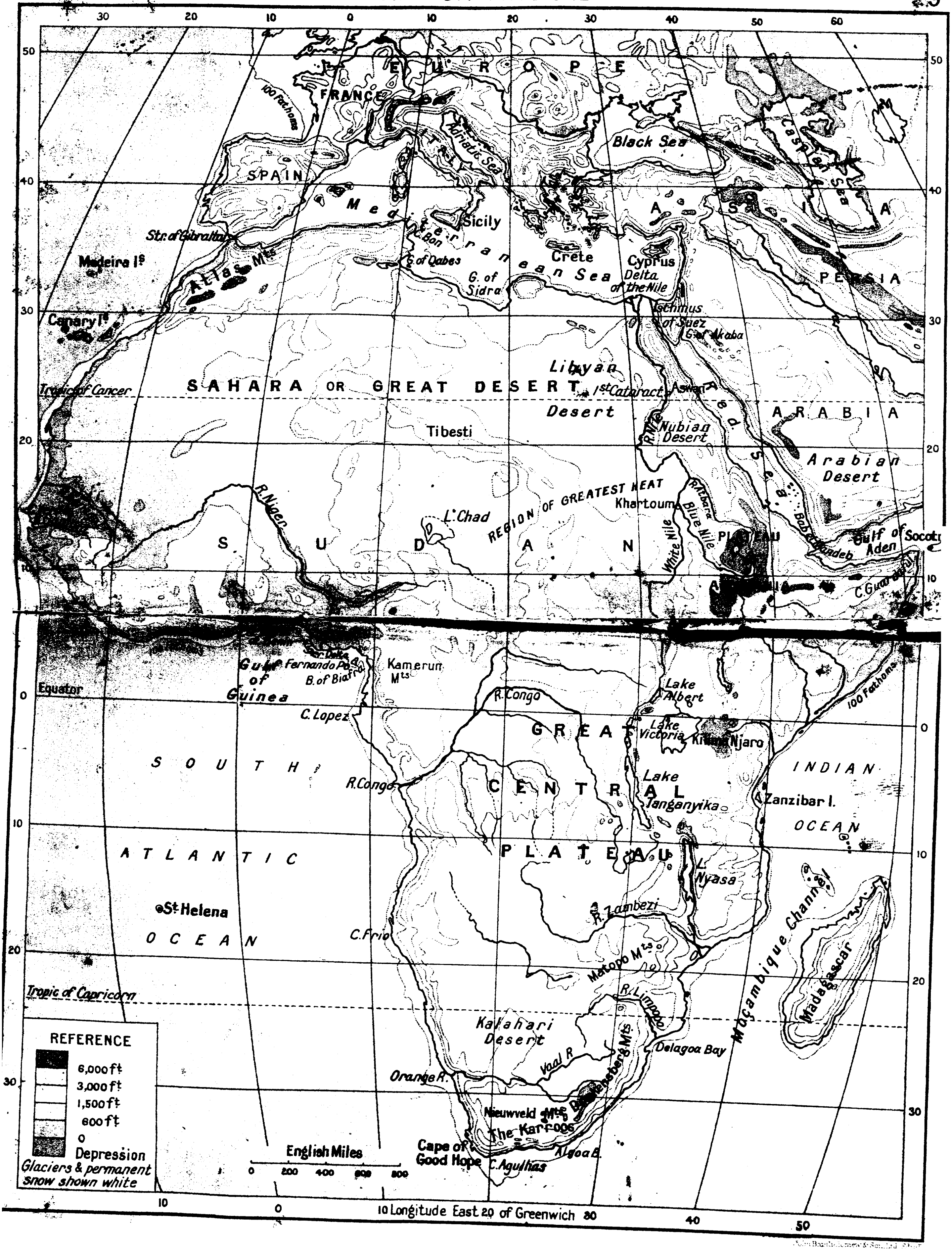
Saigon (72) is the chief town of Cochin China. It is close to the mouth of a little river and has a fairly good port. It exports rice very largely. **Hue** (61), the chief town of Anam, is also a seaport. **Hanoi** (90), the capital of Tongking, is now the capital of all Indo-China. It is the trade centre for the produce of the Red River, chiefly rice and raw silk.

71. AFRICA

BUILD, SHAPE, AND SIZE.

AFRICA is a huge block of the rocky crust of the earth, about 5000 miles in length, which was left standing when the land to the east and the west sank and became the beds of the Indian and the Atlantic Oceans. The northern part of the great land-block is now a wide plain with an average height of about 1000 feet above the level of the sea. The southern half consists of plateaus, which rise in wide terraces, one above another, to the far south, where the highest land is found. The average height

AFRICA—PHYSICAL



of this southern half is about 4000 feet. On the west and on the east there are ranges and high peaks of volcanic hills—the **Kameruns** on the west and the **Kilimanjaro** and other volcanic peaks on the east.

On the north-east of the continent there is a deep valley over 4000 miles in length. It is known as the **Great Rift Valley.** At the northern end lie the **Dead Sea** and the **Red Sea**, and farther south, at a much higher level, lie the great fresh-water lakes of East Africa—**Lake Tanganyika, Lake Nyasa**, and several more. Its sides are steep cliffs, thousands of feet high in some places.

Like India, Africa has one continuous unbroken line of coast. There are no long peninsulas and promontories stretching far into the ocean, and no long gulfs admitting the sea into the heart of the land, as in Europe. There is scarcely any water-way from the coast into the interior of Africa. The rivers (except the Nile) are not navigable in their lower courses, which consist of rapids and waterfalls down the steep slopes of the plateau on to the coastal plain, although *on the surface* of the plateau there are long stretches of navigable river.

Africa is about three times as large as Europe and seven times as large as the whole Indian empire. It extends for 35° north and 35° south of the Equator, which runs right across it. But North Africa is much larger than South Africa, for it is far wider. It is so large that it may be called Continental Africa, while the southern part may be termed Peninsular Africa.

72. AFRICA (*continued*).

CLIMATE, DESERTS, MOUNTAINS, RIVERS, AND LAKES.

ABOUT three-fourths of the surface of this continent lies within the Tropics. Except in the extreme north and the far south, where the land is elevated, Africa is a region of uniform heat. Across the centre stretches the equatorial zone of constant rain. North and south of this, so far as latitude is concerned, the two halves of the continent ought to have much the same climate for both recede from the Equator towards cooler zones. But the southern half rises to a much higher altitude than the northern, and is therefore colder. And South Africa has vast oceans to the west, the east, and the south. It has, therefore, more rainfall than North Africa, which has the great land-mass of Eurasia to the north, the north-east, and the east. Only its western coast is fully open to winds from the sea.

THE GREAT DESERTS.

The isotherms of the world (see pages 281 and 283) show that the heat equator lies, in July, across the centre of northern Africa, just below the Tropic of Cancer, and dips down in January to the Tropic of Capricorn in South Africa. The former region is the **Sahara** and the latter the **Kalahari**, both of them true tropical deserts (see pages 326, 328). The same lines mark deserts in America, Asia, Australia, and India.

The **Sahara**, the largest desert in the world, is twice as large as all India. Hot choking winds, called simooms, blow over it. In many places there are great *dunes* or heaps of sand 500 or 600 feet high. The only animal that can travel over these sandy wastes is the camel.

At the foot of the Tibesti hills, however, and in other places, water is found in hollows and in wells, and here the date palm flourishes and trees and grasses grow. These spots are called *Oases.* Here the caravans of traders with their camels halt for a short time to rest and refresh themselves and fill their water-bottles.

MOUNTAINS.

The **Atlas Mountains** run across the north-west. There are two chains, the Lesser Atlas, near the coast, and the Greater Atlas, to the south of them. Their highest peaks rise to 14,000 feet and are covered with snow. They include between them a fertile valley called the **Tell.** Their snowy summits condense the moisture and bring down the rain from the ocean winds, leaving none for the Sahara, which lies south of them.

The **Kameruns** are a block of volcanic mountains rising from the western edge of the plateau of peninsular Africa to the east of the Gulf of Guinea. The highest point on the Kameruns is about 13,000 feet.

The **Tibesti Highlands** run in a north-westerly direction through the centre of the Sahara. They rise to a height of 8000 feet and bring down the only rain that falls in that hot arid region.

The **East Coast Range** sweeps round the south-east of Africa, following the same general direction as the coast but at some distance inland. Different names are given to different parts. The range begins in the south as the **Nieuwveld** and continues as the **Drakensberg Mountains** for 300 miles up to the Limpopo River. These mountains rise to 11,000 feet, and here we find the finest scenery in South Africa. The **Matopo Hills** rise between the Limpopo and the Zambesi Rivers. Mighty volcanoes (now extinct) rise along the eastern edge of the great Central Plateau, the highest being **Kilimanjaro** (nearly 20,000 feet). Another high peak is **Mt. Kenia** (18,000 feet). These lofty mountains, covered with perpetual snow although they are just under the Equator, empty the south-east trade-winds of the water-vapour they bring up from the Indian Ocean.

The **Abyssinian Highlands** are huge blocks of land of the average height of 8000 feet, rising in parts to 14,000 and 15,000 feet. There are deep valleys between them, with steep sides a mile in depth. The rainfall on them is heavy.

RIVERS.

The great rivers of Africa are the Nile, the Niger, the Congo, and the Zambesi. The Senegal, the Gambia, the Orange River, and the Limpopo are also important.

The **Nile** (3670 miles) is the longest river in Africa and the longest, but one, in the world. The main stream, the **White** (or Clear) Nile, rises on the great lake plateau south of the Equator at an altitude of about 6000 feet. It flows in and out of Lake Victoria Nyanza and the Albert Nyanza. When it leaves the Sudan it receives two great tributaries, the **Blue** (*i.e.* Muddy) **Nile** and the **Atbara or Black** (*i.e.* Dirty) Nile from Abyssinia.

On these two mud-bearing rivers depend the fertility of Egypt and the lives of its millions of inhabitants. They rise in high mountains, and being rapid streams, tear away and carry down vast quantities of alluvium into the Nile, which conveys it to the plains of Lower Egypt and spreads it over the land on both sides of its banks far below.

The great towns on its banks and in its delta are **Dongola, Khartum, Cairo, Alexandria,** and **Damietta.** At **Assuan** and **Assiut** huge dams or anicuts have been built across the river, from which irrigation canals go over the land on both sides. The Nile is navigable for 3000 miles from its mouth.

The **Niger** (2600 miles) is the great river of the western Sudan. It rises at a height of 2800 feet, and flows through open wooded country, and then through dense forests into the Gulf of Guinea.

On it there is the great trading town of **Timbuktu,** the centre of the caravan trade of the Sahara, and the capital of the French Sudan. The chief tributary of the Niger is the **Benue,** which drains the region south of Lake Chad.

The **Congo** (2800 miles) is the greatest, though not the longest, river in Africa; *i.e.* it has the largest volume of water. It rises south of Lake Tanganyika, not far from the source of the Nile, drains the heart of Africa, and flows, for the most part, through dense tropical forests inhabited by savage tribes.

The **Zambesi** (1600 miles), the fourth great African river, rises in the highlands in the middle of the Central Plateau. In its middle course it forms the famous **Victoria Falls,** the grandest in Africa. It falls into the Mozambique channel.

The **Senegal** and the **Gambia** rise near the source of the Niger, and flow westward into the Atlantic to the north and to the south of Cape Verde. Their courses are through dense tropical forest and then over a hot, damp, coastal plain, enclosing between them the country called Senegambia.

The **Orange River** (1000 miles), with its tributary the Vaal, is the great river of the British self-governing colonies included in the Union of South Africa. It rises in the Drakensberg Mountains and flows westward into the Atlantic.

LAKES.

The Lakes of Africa are larger and more numerous than those of any other continent except North America. There is a chain of them lying at the bottom of the great Rift valley from 1500 to 4000 feet above sea-level.

Victoria Nyanza, greatest of African lakes and second only in size to Lake Superior, has an area of about 25,000 square miles and a shore line of over 3200 miles. The Nile flows through it. Steamers ply from place to place on its banks. It lies on a plateau between the two northern arms of the Rift valley.

Albert Nyanza lies in the Rift valley. The Nile flows through it. It is on a lower level than the Victoria and much smaller.

Tanganyika is the longest lake (compared with its breadth) in the world. It is 420 miles long and its breadth varies from 30 to 50 miles. In some parts it is very deep. It lies between cliffs several thousand feet high.

Nyasa, which lies in another narrow valley, is the southernmost of the Rift valley lakes.

Chad is a deep depression on the southern border of the Sahara. The high country around it drains into it. It has no outlet and loses much of its water by evaporation in the hot season.

73. AFRICA (*continued*).

CLIMATIC AND VEGETATION ZONES—RACES OF MEN—ANIMALS.

THE *Climatic Zones* of Africa are marked out by the factors described in Lessons 57, 58.

We pass through similar zones of vegetation as we go north and south from the Equator (see p. 325), *i.e.* we have first the equatorial forests, then the tropical grass-lands, then the savannas, then the steppes and the deserts, and lastly the deciduous forests of the Atlas region on the far north and those of the Drakensberg region in the extreme south.

The N.E. trades, coming from the land, *i.e.* Eurasia, are dry winds and bring no rain. The S.E. trades, blowing from the sea, are wet winds, and part with their water-vapour on the high mountains of eastern and south-eastern Africa, and then go on blowing as dry winds over the interior. The westerly winds from the Atlantic, when they pass over heated lowlands such as the Sahara, bring no rain except over high hills and mountains, *e.g.* the Atlas Mountains, the Tibesti Highlands, and the Kameruns. There is good rainfall, as we have seen, on the Atlas Mountains.

Races of Men.—Apart from the Europeans, who are new-comers, and the Indians, who are still comparatively few in number, there are three great races of men in Africa. These are (1) Dark or Black Caucasians—Arabs, Berbers, and Egyptians—in the north; (2) Negroes, including Bantus, Zulus, and Hottentots, in the centre and south; and (3) Bushmen in the south-west, including Pygmies or Dwarfs.

The *Bushmen* (men of the bushes) are supposed to be the oldest of these races, and the most savage. They are very small in size, and yellowish-black in colour. They speak a curious language full of "clicks," such as a driver uses to cattle to make them go. The Pygmies live in the densest forests. They are the smallest known race of men, being about 4 feet 6 inches high, and are very seldom seen.

The Negroes.—There are hundreds of different tribes of negroes who inhabit Central and Southern Africa. A very widely spread race are the Bantus, of whom the most intelligent are the Zulus and Bechuanas. They are not so dark as the other negroes, and are finer men. In South Africa there are the Hottentots, a mixed race from the negroes and Bushmen. The typical negro, with very black skin, woolly hair, thick lips, and projecting jaws, is found in the dense forests to the north of the Equator in Central and West Africa. The most advanced live in the free State of Liberia, under the care and protection of the United States of America.

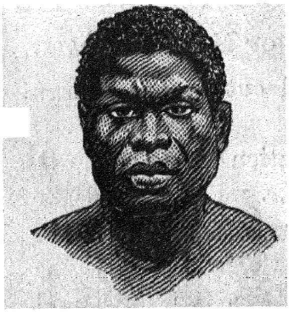


FIG. 168.—NEGRO.

The *Dark* or *Black Caucasians* are all Muhammadans. There are two sub-races: the *Semites*, including the Arabs and Jews and the Berbers, partly of Arab blood, who inhabit the Barbary States, Tunis, Algeria, Egypt, and Abyssinia; and the *Hamites*, including the Somalis, Nubians, the tribes of the western Sahara, and some of the Abyssinians.

The *Wild Animals* of Africa are larger in size and more numerous than those of any other continent. Instead of deer, we find many varieties of antelopes, the difference between these two classes of animals being that the horns of the antelope are hollow, growing upon bony cores which spring from the skull and remain through life; while in the deer the horns are solid, and are "shed" or cast off every year, fresh horns growing in their place. The horns of the deer usually divide into several branches and are called antlers. The horns of the antelope are long and usually twisted. There are no deer in Africa, nor are there any bears south of the Atlas region, where the animals are mostly those of the south of Europe—one proof that Northern Africa was once a part of Europe.

The Apes.—First among mammals are the monkeys, and at the head of the monkeys stand the anthropoid (man-like) apes. Those found in Africa are the gorilla and the chimpanzee. The gorilla is the biggest and strongest of all the apes, and is often 6 feet high. He has very long powerful arms which reach below his knees, and he can swing himself 20 feet from bough to bough. Apes, like men, are diurnal in their habits, *i.e.* they sleep at night and are awake in the day. The apes live in the trees and cannot walk upright on the ground, for their feet are like hands and have no instep. They build huts out of branches and leaves for their families in

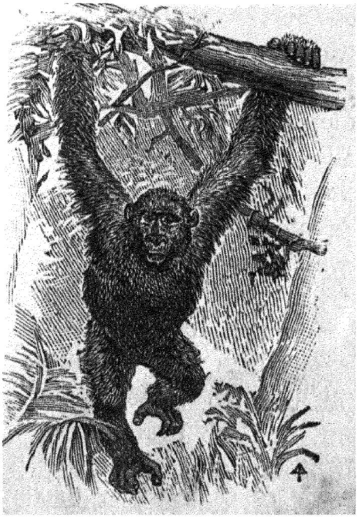


FIG. 169.—GORILLA.

the trees. They feed on fruit and nuts and inhabit the densest and darkest jungles near the Equator. The chimpanzee is 5 feet high.

Baboons, or dog-faced monkeys, do not live in forests but in open rocky country. They are quadrupeds, and can run along the ground with great swiftness. Their arms and legs are about the same length. They are found in large herds in South Africa, and go out at night to plunder orchards.

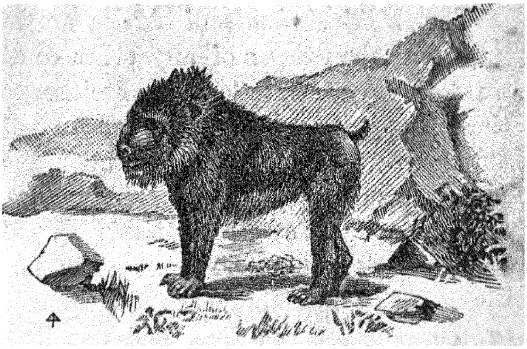


FIG. 170.—BABOON.

The *Elephant* is by far the largest, though not the tallest, of all land animals, and is often 10 to 12 feet in height. It is found in dense jungles, for it cannot bear the heat, and only comes out into the open country in the cool of the day to find water to drink and to bathe in. The African elephant differs from the Indian in various ways. One is in the great size of its ears, which are from 5 to 6 feet broad. Its legs are much longer. Its trunk has two fingers at the tip instead of one. Both the male and the female have tusks, though those of the male are longer, often growing to a length of 9 feet. The African elephant has never been tamed, like the Indian, and trained to work. The ivory is so valuable that the elephants have been killed in many places where they once abounded.

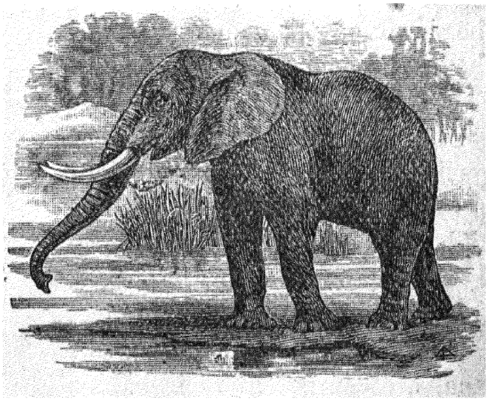


FIG. 171.—AFRICAN ELEPHANT.

The *Rhinoceros* is next in size to the elephant of land animals. The African variety differs from the Indian. It has two horns and is without the thick folds of skin which cover its Indian cousin. The Rhinoceros lives in the forests and eats twigs and leaves like the elephant. Herds are found in all the wilder countries from Abyssinia to the Cape Province. One variety eats grass and inhabits grass-lands.

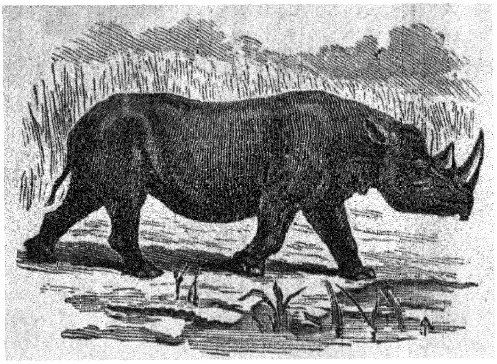


FIG. 172.—AFRICAN RHINOCEROS.

The *Giraffe* is the tallest of living animals, being 18 or 19 feet in height, as tall as two elephants, one standing on another. It has very long legs and a very long neck. It needs these, for its food is the leaves of tall trees which have no branches near the ground. It has a long tongue, which curls round a leaf and so pulls it off a branch. Its long legs enable it to run so fast that even a swift horse cannot overtake it. Its great height enables it to see far and wide over the plains and flee in time from its enemies. Its skin is spotted, so that it looks, in a clump of trees, like a tall tree with the sun shining on the leaves here and there. It is found all over Central and Southern Africa, even in the Kalahari. Like the camel, it can go for days without drinking.

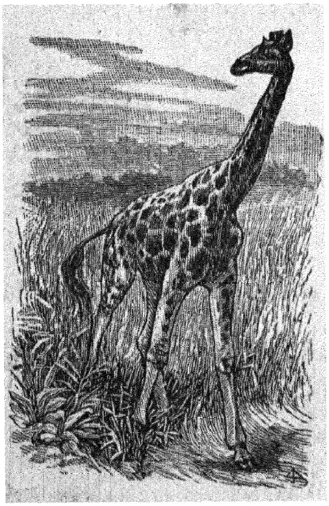


FIG. 173.—GIRAFFE.

The *Zebra* is a species of wild horse with stripes on its body, found only in Africa. It is a beautiful and harmless animal. Large herds are found in the savannas, for the zebra feeds on grass. There are herds of hundreds and even thousands in the great Rift valley, but they are fast disappearing before the advance of civilisation. In East Africa they are still common. One variety has been tamed in South Africa and trained to draw carts and carriages.

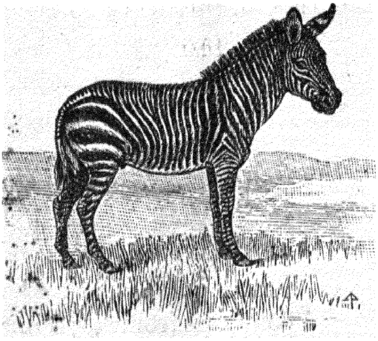


FIG. 174.—ZEBRA.

The Lion.—This king of beasts is the lord of the "rolling seas of grass"—the savannas—and the monarch of the steppes. Its colour, a tawny yellow, shows that its habitat was once the desert, where the sand is of the same colour, and it is still found all over the Kalahari. The larger grass-feeders, the zebra and the antelope, the buffalo, the ox, and the donkey, are its natural prey. Civilisation has driven the lion out of Europe, and in Asia it is found only in certain tracts, but there are still great numbers in Africa, especially in East Africa and Somaliland. Old lions, like tigers, often become man-eaters.

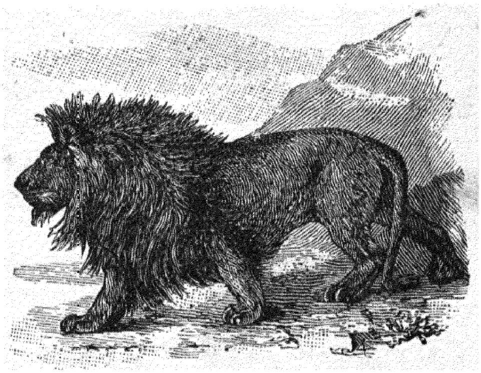


FIG. 175.—LION.

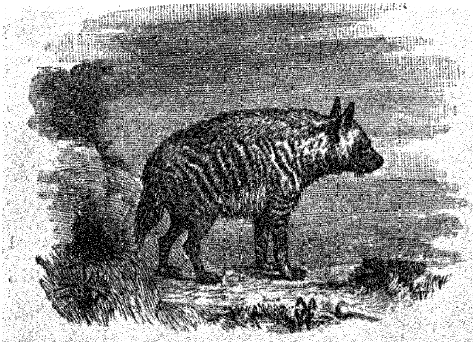


FIG. 176.—STRIPED HYENA.

The *Hyena* is an ugly and filthy animal of the dog tribe. It has very strong jaws and teeth, and, like the jackal, follows the lion to eat up whatever he leaves. There are several species. The striped hyena is found in North Africa, the brown hyena in South Africa. The spotted or laughing hyena is larger and fiercer than the other kinds. Its howl sounds like strange unearthly laughter. It kills goats, donkeys, cattle, and even carries off children.

Antelopes.—There are a great many varieties in Africa, where they take the place of deer. Their natural home is the open country, where their long legs and great swiftness save them from their enemies—the lion, the wild dog, and the hyena. They could not live in dense forest. The grass-lands of the Warm Temperate zone suit them exactly, and here they are found in herds in countless numbers. There are many varieties. The *Hartebeest* is not so graceful as other antelopes. The shoulders are much higher than the hind quarters. These antelopes go in herds, an old buck keeping watch, often on the top of an ant-hill, while the rest are grazing.

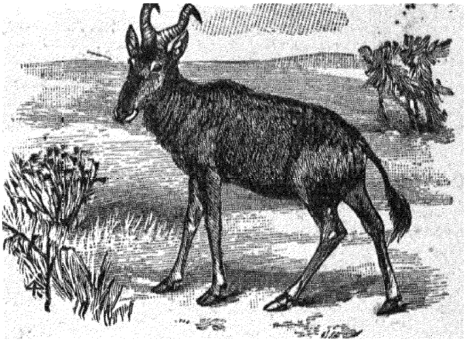


FIG. 177.—HARTEBEEST.

The *Hippopotamus* (river-horse) is really a monstrous water-pig with an enormous head, mouth, and teeth. It is the largest fresh-water mammal, as the whale is the largest salt-water mammal. It has a huge heavy body, from 12 to 14 feet long and about 14 feet in girth. It uses its great teeth for rooting up the grasses and water-plants on which it feeds. Hippopotami are found in large

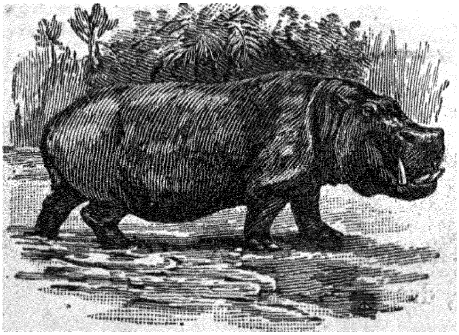


FIG. 178.—HIPPOPOTAMUS.

numbers in many of the rivers and lakes. At night they come out on the banks to feed.

The *Ostrich* is the largest of all living birds, for it is taller than the tallest man. Although it is a bird it cannot fly. It belongs to the class of running birds. Instead of claws it has two toes on each foot. Like the giraffe and the camel, it is suited for life on the open plains, and is found in the savannas, the steppes, and even in the Kalahari Desert. It can outstrip the fastest horse, running in great strides of 20 to 25 feet between each step. Its beautiful feathers are so valuable that in South Africa ostriches are kept in large farms, the feathers being cut off twice a year.

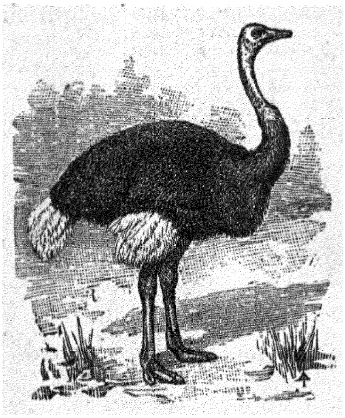


FIG. 179.—OSTRICH.

The Crocodile.—This huge lizard is found in all the rivers and many of the lakes. There are so many in the Limpopo that it is called the Crocodile River. The skin is covered with scales like plates of armour. The African crocodile is from 12 to 15 feet long. It lives in the water and can remain under water for half an hour. Crocodiles eat anything they can catch—rats, water-fowl, sheep, goats, antelope, men, women, and children. They lie in wait at the edge of a river or lake, only their nostrils being above the water. They seize the nose or leg of any animal that comes down to drink, drag it under water, drown it, and devour it.

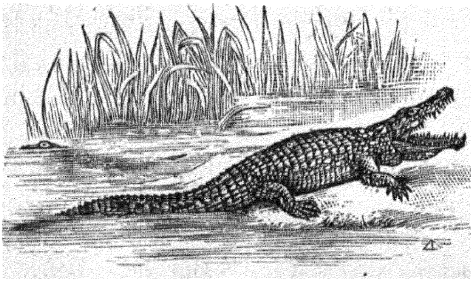


FIG. 180.—CROCODILE.

74. AFRICA (*continued*).

POLITICAL.

BRITISH SOUTH AFRICA.

THE vast continent of Africa has been gradually occupied by some of the great Powers of Europe. It is of all the continents (but Asia) the most interesting to Indians, because many thousands of Indians have settled in it for trade and other purposes. The climate suits them: there are large spaces of unoccupied country, and there is room for millions more.

The British were the earliest comers, and they have by far the best part of the continent. The French have the largest territory, but most of it is desert. The Italians, the Belgians, and the Portuguese have also large territories. The Germans had (in 1914) three tracts of country on the eastern and western coasts. They were driven completely out of them by British forces in the war of 1914–1918.

UNION OF SOUTH AFRICA AND RHODESIA.

The Union of South Africa includes four self-governing colonies:

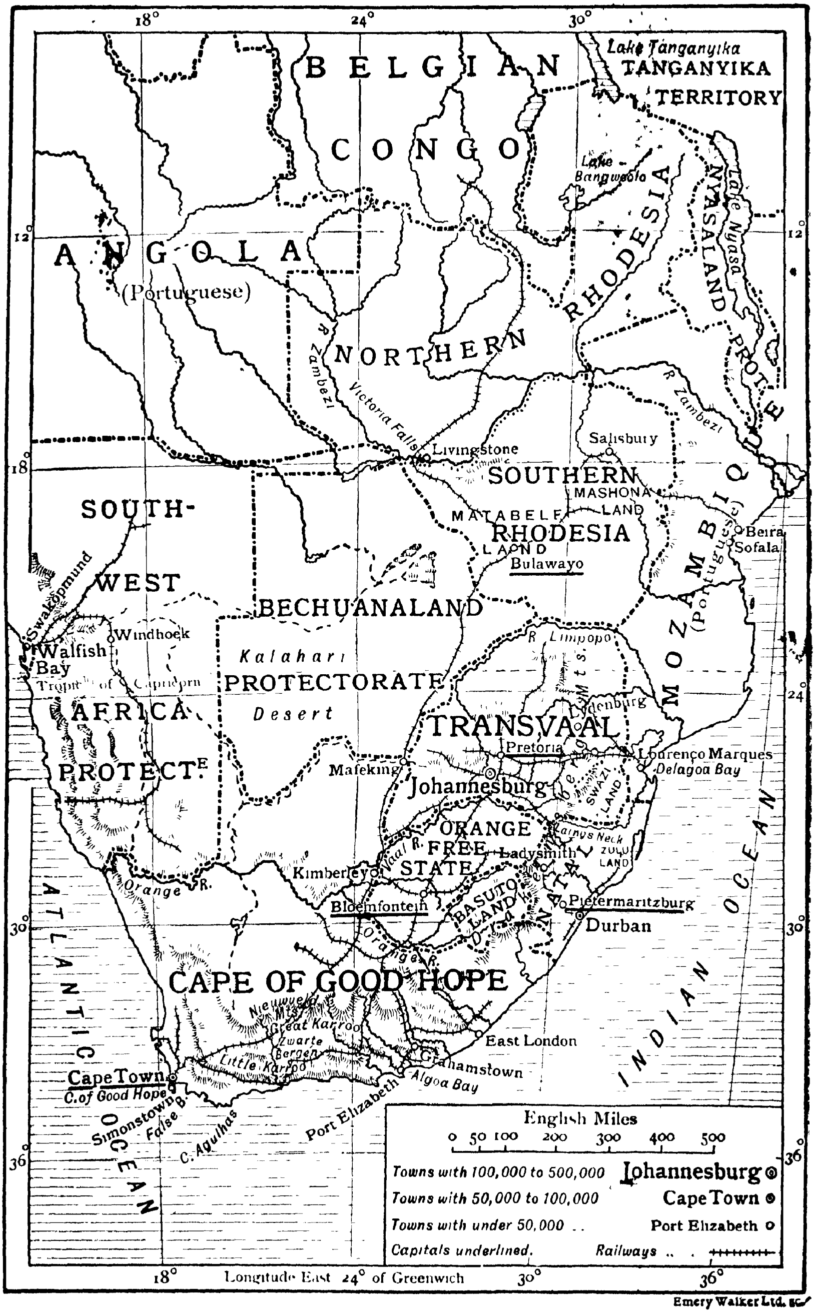
1. The Cape of Good Hope.
2. The Transvaal.
3. The Orange Free State.
4. Natal.

The area, population, miles of railway open, and the value of the total exports and imports will be found in Appendix I. at the end of the book.

The total population of about 7 million includes about 1½ million of white races, the rest being "coloured," *i.e.* native Africans, Indians, and others.

The government is vested in a Governor-General appointed by the Sovereign. He is aided by an Executive Council chosen by himself. There is a Parliament, consisting of the King, a

BRITISH SOUTH AFRICA



Senate, and a House of Assembly. **Pretoria** is the capital of the Union and **Cape Town** the seat of the Legislative Council.

The white population is largely of Dutch descent. The Boers or Dutch farmers fought with the British and were conquered. After peace was made, the four provinces were in 1910 formed into the Union as a part of the British Empire, and the Boers fought bravely in the British army against the Germans, whom they drove out of their territory in what used to be called German West Africa.

Cape of Good Hope or **The Cape Province.**—The Cape Province proper lies between the Orange River and the sea. The land rises in terraces, called *Karroos*, from the coast up to the main plateau. The land then slopes downwards to the Orange River, beyond which lies the Kalahari Desert, stretching northward for 1000 miles with a breadth of about 600 miles. It is a high plain standing from 3000 to 4000 feet above the level of the sea.

The climate of the Cape Province is pleasant. The air is dry and bracing. The average rainfall is 26 inches. It is, of course, much colder on the mountains in the interior.

The chief crops in order of importance are maize, wheat, oats, barley, rye, pumpkins, potatoes, beet, and lucerne. A good deal of wine is made. Sheep-rearing is an important industry, and there are large ostrich farms. The chief exports were gold, diamonds, wool, skins, feathers, mohair, raw hides, and maize. The diamond fields are the richest in the world.

Cape Town (206½), the chief port of the Cape Province, is a fine city with great trade, built at the foot of a flat-topped hill called Table Mountain. **Simonstown**, a few miles distant on another bay, is the naval base of the British fleet in S. African waters. **Port Elizabeth** (46), on Algoa Bay, is the second port of the province. **Kimberley** (39), in the north beyond the Orange River, is the chief seat of the diamond mines. **East London** (35) is a growing seaport at the mouth of the Buffalo River.

Natal lies on the coast north of the Cape Province. The population includes 130,000 Indians. It is a well-watered country, having about thirty-five little rivers running down from the plateau into the sea, but not one of them is navigable. The leading exports are sugar, tea, maize, and wattle-bark. The climate varies at different levels. On the coast it is hot and damp. The average rainfall over the province is 34 inches. The capital city is **Pietermaritzburg** (35). **Durban** (140) the largest town, and the first seaport of the Union as regards trade. In this town there are 20,000 Indians.

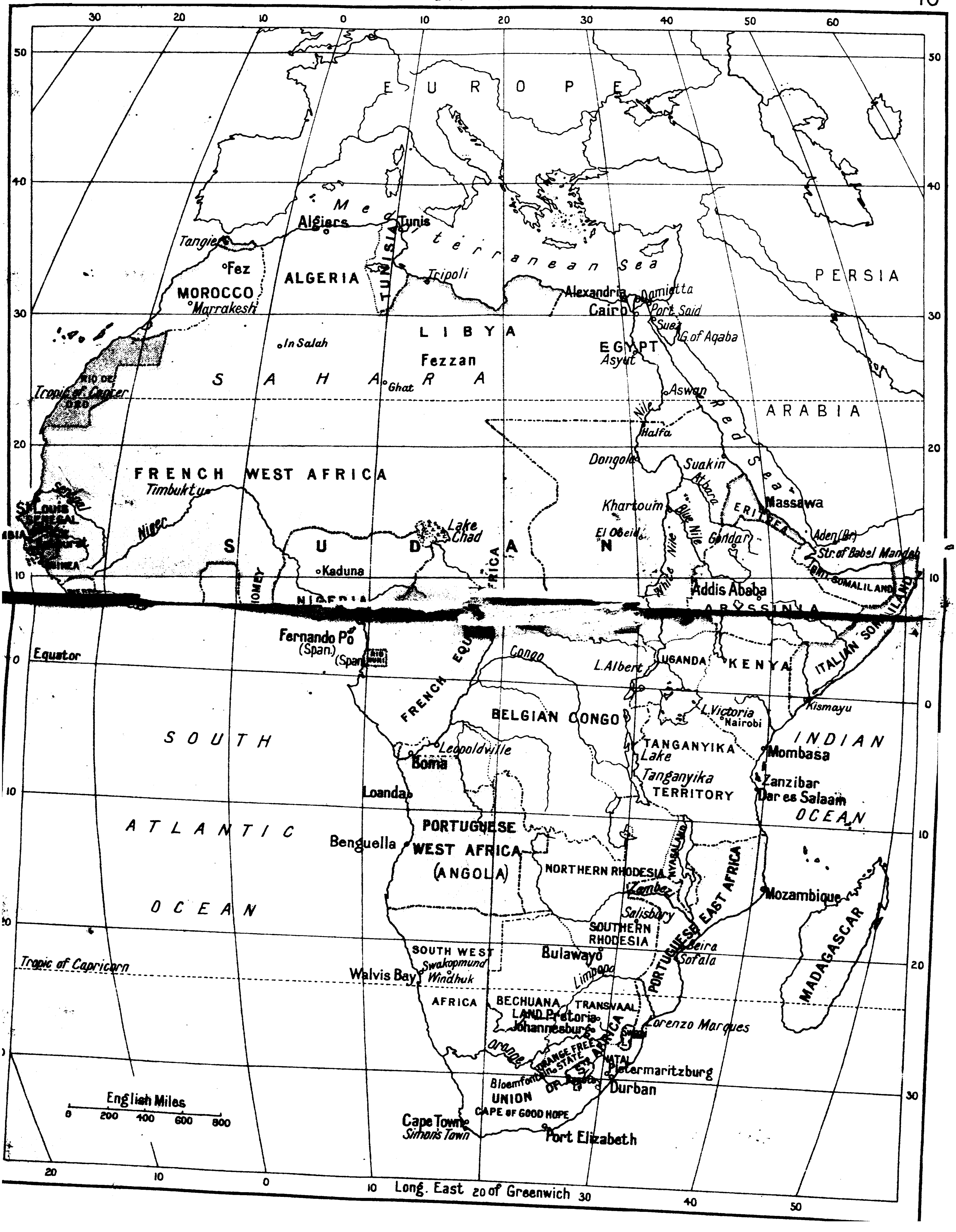
Transvaal.—This province lies across (Trans) th[illegible] to the north of the Orange Free State. It lies mostly on the plateau at an elevation of from 4000 to 6000 feet. The population includes about 14,000 Indians. The climate is, on the whole, healthy and bracing, but ranges from 100° in summer to freezing-point, at night, in winter, when the days are bright, sunny, and cloudless. The rainfall is heavy on the eastern hills, but it decreases westward.

The Transvaal is mainly a cattle-raising country, but there are large tracts well suited for the growing of crops. Maize and tobacco are the most important crops now cultivated. There are very rich gold and diamond mines. The former are in a goldfield called **Witwatersrand** (White-waters-ridge) or simply "The Rand," a low rocky ridge about 50 miles in length. It is the richest goldfield in the world. **Pretoria** (30) is the capital of the province. **Johannesburg** (284), in the centre of the goldfields, is the largest town, with about 14,000 Indians.

The Orange Free State.—This inland province, formerly known as the Orange River Colony, lies between the Orange River and its tributary the Vaal. The climate is dry, and the main industry is stock-raising. The chief crops are wheat, oats, maize, and barley. The chief town is **Bloemfontein** (39), 4500 feet above sea-level.

Basutoland, a plateau of about 12,000 square miles in the south-east of the Free State, is under a Resident Commissioner. It is a well-watered tract with an excellent climate, and is the finest grain-producing country in South Africa. The scenery is grand and beautiful. The abundant grass enables the Basuto to rear immense herds of cattle.

AFRICA—POLITICAL



Rhodesia. — This large territory, named after the great Englishman, Cecil Rhodes, extends from the Transvaal northwards to the Congo State. It is under the administration of the British South Africa Company, which rules under a Royal Charter, as the East India Company did in India. It is divided by the Zambesi into Northern and Southern Rhodesia.

Southern Rhodesia includes the two provinces of Mashonaland and Matabeleland. The exports are (besides gold) maize, tobacco, chrome ore, and copper. **Salisbury,** the capital, is in Mashonaland. It stands 4900 feet above the sea. **Buluwayo** (4500 feet) is the commercial centre of the country.

Northern Rhodesia.—The crops are maize, cotton, and tobacco. The headquarters of the administration are at **Livingstone,** on the Zambesi. **Fort Jameson** is another important town.

75. BRITISH NORTH, EAST, AND CENTRAL AFRICA, AND EGYPT.

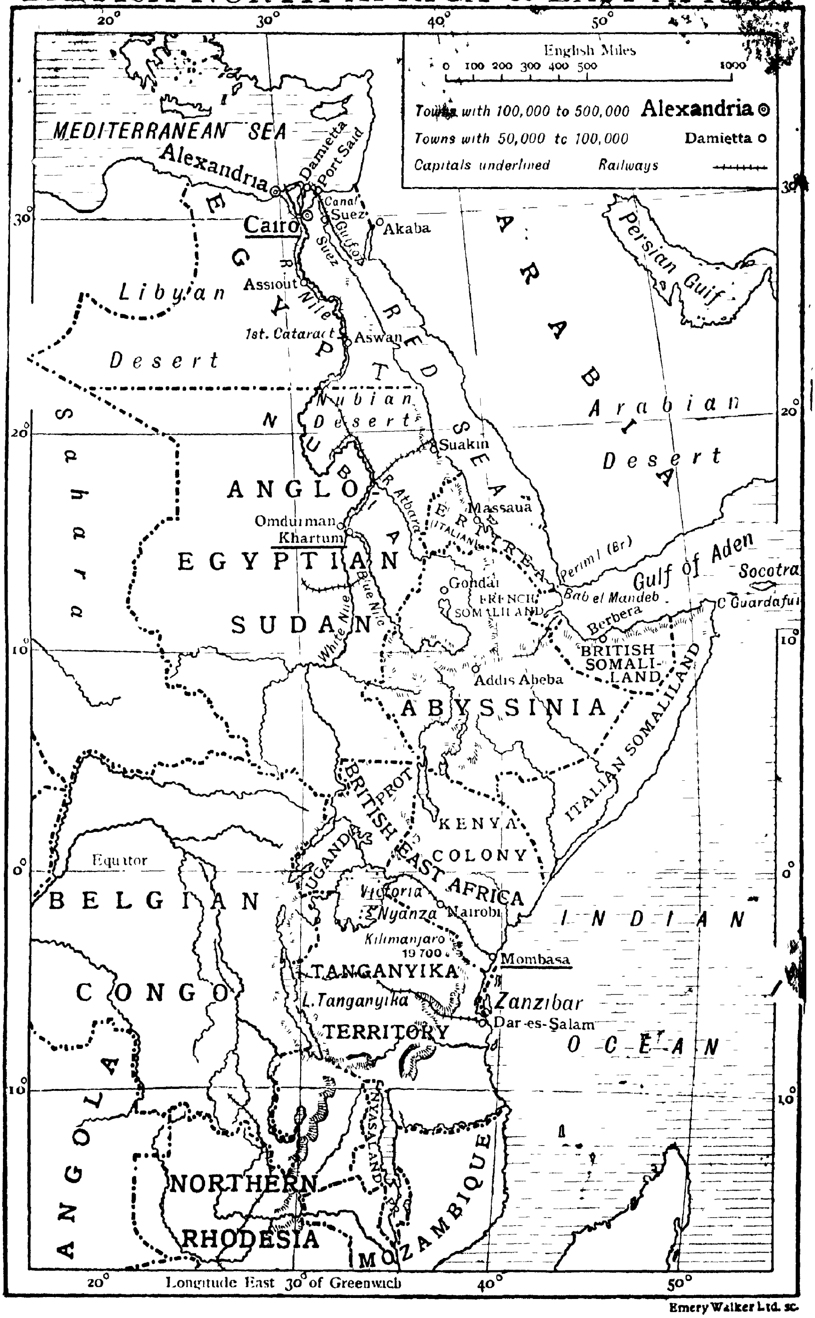
British North Africa includes the Anglo-Egyptian Sudan.

British East and Central Africa include :

1. Kenya Colony.
2. Tanganyika Territory.
3. The Uganda Protectorate.
4. The Zanzibar Protectorate.
5. The Nyasaland Protectorate.

For area, population, etc., see Appendix I.

Egypt.—Egypt was formerly under a Khedive who was tributary to Turkey. Egypt is now (1922) an independent sovereign state under its own King, under the protection of the British. The government is carried on by seven native ministers, styled Pashas. Egypt is divided into fourteen provinces and five large towns, the latter being Cairo, Alexandria,



BRITISH NORTH AFRICA & EAST AFRICA

Emery Walker Ltd. sc.

Saïd (including Suez Canal and Ismailia), Suez, and Damietta.

Egypt has an area of about 400,000 square miles, but this includes the Libyan Desert and Mount Sinai, which have scarcely any inhabitants. The whole population of about 12¾ millions is crowded into the narrow valley of the Nile, which covers about 12,000 square miles and is divided into Lower and Upper Egypt. The population includes many Greeks, Italians, and about 21,000 British and 15,000 French, chiefly in the great cities in Lower Egypt.

The **Suez Canal**, including 4 miles of approaches, is 103 miles long. It was opened in 1869. Steamers and the mails from India and the East to Europe pass through it.

Cultivation in Egypt is by irrigation from a network of canals which lead off from the Nile. The chief crops are cotton, rice, maize, millets, sugar, wheat, and barley. There are about 1500 miles of railway, the main line being that going southward to the Sudan. It will be carried right through to the Cape, and called the Cape-Cairo Railway. It has already advanced over 2000 miles from the Cape northwards.

The climate of Egypt is hot and dry. It is really a part of the Sahara, and, except in the narrow valley of the Nile, it is a desert. The rainfall at Cairo is a little over 1 inch, and even at Alexandria close to the sea it is only about 8 inches.

Cairo (791), the capital of Egypt, is the largest town in Africa. Its situation on the Nile explains its growth, size, and importance. **Alexandria** (445), the second largest town, is the chief port on the delta, on the Mediterranean Sea. **Port Said** (91) has been made a large and important town lately by the Suez Canal. It stands at the point where the canal runs into the Mediterranean Sea, and is a great port of call and coaling station for steamers from India. It is connected by rail with Cairo and Suez. **Damietta** is a port in the centre of the delta coast-line. **Suez** (31) is a port at the southern end of the canal, named after it. **Assiut** and **Assuan** are the chief towns of Upper Egypt.

Anglo-Egyptian Sudan.—This is a vast territory of nearly a million of square miles, almost as large as all British India.

The Sudan is the chief source of the world's supply of ivory and gum-arabic. Other products are cotton, ostrich feathers, palm-nuts, dates, sesame, hides and skins. The chief food-crop is a millet called durra. The forests are rich in ebony, the gum-acacia, bamboos, and rubber.

Khartum (23), on the Nile, is the capital, and a rising town. **Omdurman** (51) is the old dervish capital.

Kenya Colony and **Tanganyika Territory** are each of them administered by a Governor with an executive and legislative council. The crops are rice, cocoa-nuts, cassava, maize. There are large forests with valuable timber trees—the ebony, cedar, copal, jarrah, and iron-wood. The exports are cotton, hides, gram, oil-seeds, skins, ivory, and copra. On the lowlands the mean temperature is 78°. It is cooler on the inland plateau. **Nairobi** (24), the capital of Kenya, is the central station of the Uganda railway. **Mombasa** (30), capital of Tanganyika, is a seaport.

In the construction of the Uganda railway it was necessary to import about 20,000 Indians, chiefly Punjabis. When the railway was built, they settled in the country. Indians are found throughout the inhabited parts of the East Africa Protectorate. The climate suits them. They are shrewd, thrifty, and hard working.

Uganda Protectorate is a block of country about 800 miles from the east coast. It includes the eastern part of Lake Victoria Nyanza, nearly all Lake Albert Nyanza, half of Lake Rudolf, and the upper course of the Nile. It has five provinces divided into districts under British officers. There are many native kings and chiefs, who conduct the government of their own countries. The climate is mild but feverish and very unhealthy for Europeans. The scourge of the country is the "sleeping sickness" along the shores of the great lakes and rivers, particularly the Nile valley. It is caused by the bite of the *tsetse fly*, a deadly insect which swarms on the shores and the islands of Lake Victoria Nyanza and bites cattle and men. The soil is very fertile, and the output of cotton is yearly increasing. The chief exports are cotton, hides, skins, ffee, ground-nuts, chillies, ivory, and ghee. **Entebbo** is the pital. It is the chief port on the Victoria Nyanza.

Zanzibar Protectorate.—Zanzibar is a small island about 6° south of the Equator, and is separated from the mainland by a channel 22 miles across at its widest part. It is the largest *coral* island on the African coast, being 48 miles long by 15 broad. The government is administered by a High Commissioner and a British Resident. There is a Sultan of Zanzibar who is the President of a council to aid the British Resident.

Zanzibar might well be called **Clove Island**, for most of the world's supply of cloves comes from it. There are also large cocoa-nut plantations. The chief exports are cloves, copra, ivory, and petroleum. Zanzibar (35), the capital town, has one of the finest ports in Africa.

Nyasaland Protectorate, the high plateau north of the Zambesi, includes the western shore of Lake Nyasa. It is divided into fourteen provinces under British Residents. The products are many and varied, including cotton, tobacco, tea, coffee, chillies, rubber, rice, and maize.

Somaliland Protectorate is a small tract of land in what is sometimes called the "Horn of Africa," *i.e.* a headland ending in Cape Guardafui, to the south-east of Abyssinia. The inhabitants are Muhammadan nomadic tribes, under chiefs known as "darwishes," much given to fighting with one another. The exports are skins, hides, gum, feathers, and ivory. **Berbera** (30), on the coast, is the chief town.

76. BRITISH WEST AFRICA.

British West Africa includes—

1. The Colony and Protectorate of Nigeria.
2. Gold Coast Colony, Ashanti, and the Northern Territories.
3. The Colony and Protectorate of Sierra Leone.
4. The Colony and Protectorate of Gambia.

There are thus four colonies along the coast, going some distance inland, and attached to each of them a Protectorate, still farther inland, well to the east of the colonies. In each

Protectorate there are African tribes, ruled by their own chiefs or kings. They are all under the control of British Residents or Governors.

Nigeria.—This vast province is so named from the river Niger, which flows through it and is the great inland waterway of the western Sudan. The chief products of the country are palm-kernels and palm oil. Other exports are cotton, cocoa, tin ore, and ground-nuts. Iron and lead mines are worked. The crops grown are ground-nuts, capsicums, coffee, and cocoa.

Lagos, on an island, is the capital of Nigeria. It is the only port along 1000 miles of coast, and is one of the largest and most up-to-date towns in West Africa.

Gambia extends inland for about 250 miles on both banks of the river of the same name. The capital city is **Bathurst.** The climate is hot, damp, and unhealthy. The exports are ground-nuts, gold, hides, and palm-kernels.

Gold Coast (Appendix I.) stretches east and west along the Gulf of Guinea. The climate is hot and damp on the coast. The staple products and exports are palm oil and kernels, kola-nuts, cocoa, rubber, and timber. The colony gets its name from the gold which was exported from this coast for centuries before it was obtained elsewhere in Africa.

The King of Ashanti is the chief of the African kings or chiefs of the country. His capital is **Kumassi.** The crops of Ashanti are yams, cassava, maize, and bananas.

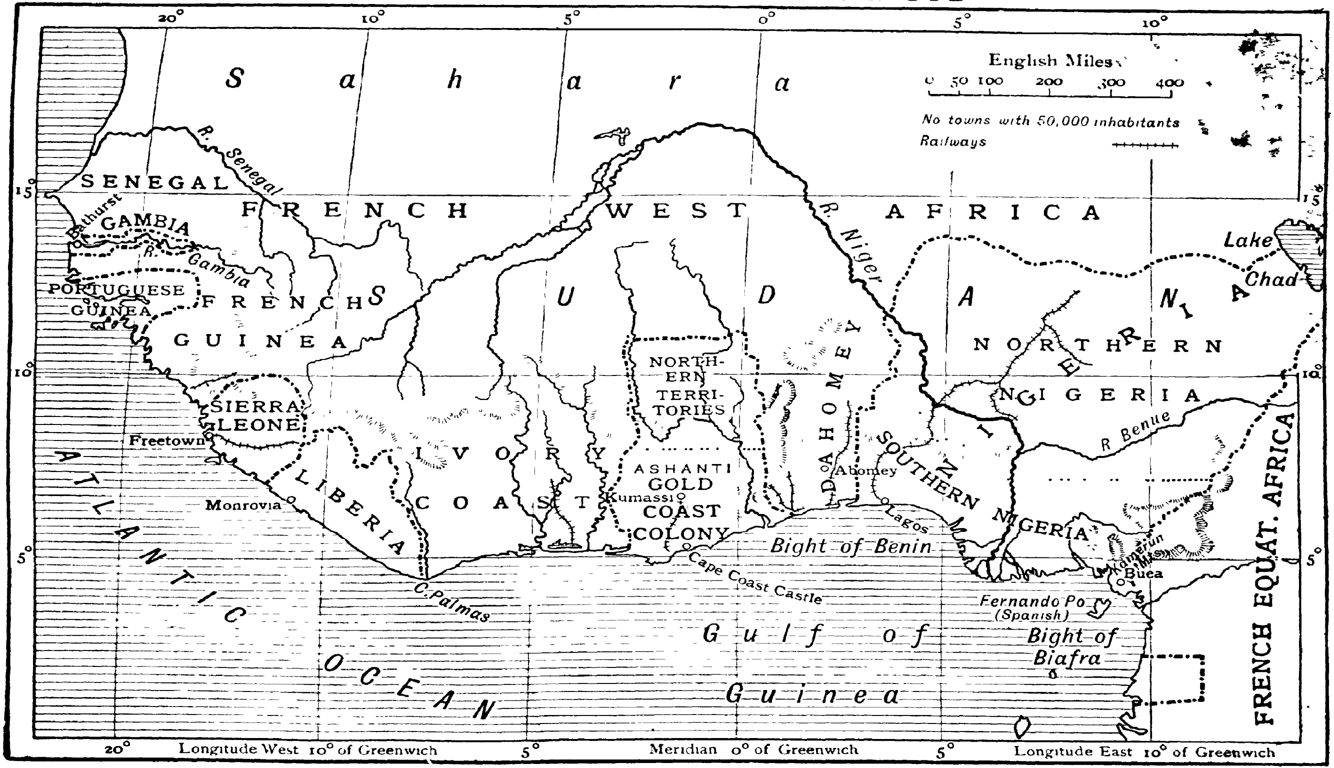
Sierra Leone is a very hot and rainy tract. The exports are palm-kernels and oil, kola and ground-nuts, ginger, copal, and rubber. The staple crop and food of the people is rice. **Freetown** (34), the capital, is the headquarters of the British forces and the strongest seaport in West Africa. It has a fortified harbour.

77. NON-BRITISH AFRICA.

French Africa.

The French Colonies and Protectorates are all in Continental Africa, on the north and north-west, on the Mediterranean coast,

BRITISH WEST AFRICA



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and the Sahara and Sudan. They are as follow: (1) Algeria, (2) Tunis, (3) Morocco, (4) Sahara, (5) Senegal, (6) Upper Senegal and Niger, (7) Guinea, (8) Ivory Coast, (9) Dahomey, (10) Mauritania, (11) Congo, (12) Somali Coast, (13) Madagascar.

The position of each of these countries is shown on Map 10. The area of French Africa is about 4½ millions of square miles, *i.e.* about four times the size of British India. Of this immense territory the greater part is a desert (the Sahara) about double the size of all India including the Native States.

Algeria (in the Atlas region) is a colony with a population of about 5 million. On the Mediterranean coast the products are wine, oranges, olives, dates, figs, citrons, bananas, and other fruits. There are fertile valleys between the hills. The chief crops are wheat, barley, oats, maize, potatoes, flax, and tobacco. The valuable metals are iron, zinc, tin, and lead. **Algiers** (206), with a pleasant climate, is the capital, and has many visitors from Europe in winter.

Tunis is a Protectorate. It has a ruler styled a Bey. There is a resident French Minister, and seven out of nine heads of departments are French. The products are much the same as those of Algeria, with the addition of cork and phosphates.

Morocco is also a Protectorate. The government is an absolute despotism under a Sultan who is both chief of the state and head of the religion, which is Muhammadan. He is bound to follow the advice of a French Resident-General. The chief exports are wool, eggs, and almonds. The country is very backward in every way. The chief towns are **Fez** (the red conical caps made here are known everywhere), **Tangier**, and **Morocco**.

The **West African Colonies and Protectorates** (Senegal, etc.) have much the same products as the British colonies in the same region, and are governed in the same way as the French colonies in North Africa. **St. Louis** (23) is the capital of Senegal.

Madagascar, by far the largest island on the coast of Africa, is a French colony ruled by a Governor-General. It is about 1000 miles long and 360 miles broad, with a population of about 3½ million. It is separated from Africa by the Mozambique Channel, 240 miles across. The interior is mountainous, with peaks rising to 9000 feet. The chief products are rubber, tea, coffee, cocoa, manilla, tobacco, and cloves. The chief export gold.

Antanānarivo (63), in the interior, is the capital.

Portuguese Africa.

The Portuguese Colonies in Africa (see Map 10) are: (1) Angola, (2) Mozambique, (3) Portuguese Guinea.

Angola (to the south of the Congo), with a coast-line of 1000 miles, has a population (1913) of about 7 million. There are 800 miles of railway. The chief products are coffee, rubber, wax, sugar, cocoa-nuts, ivory, and dried fish. **Loanda** is the capital, with a good harbour.

Mozambique, on the east coast, has an area of about 300,000 square miles and a population of about 3 million. The Zambesi River flows through it. The chief products are sugar, cocoa-nuts, beeswax, rubber, ivory, and metal ore. The chief town is **Mozambique** (365), a very large and flourishing seaport. **Lorenzo Marques** and **Beira** are seaports with great trade.

Belgian Africa.

This territory is known as the **Belgian Congo**. It is a vast tract of about a million square miles, with a population of about 15 million. The Congo and its tributaries are the great waterways of the country, which is densely forested. The chief products are rubber, palm-nuts, and oil, white copal and cacao. Ivory is also a large export. Coffee and tobacco grow well. The chief town is **Boma** on the Congo. **Leopoldville**, also on the Congo, is another large town.

Italian Africa.

The countries in Africa belonging to Italy are: (1) Tripoli, (2) Eritrea, (3) Italian Somaliland.

Tripoli is divided into provinces and districts under governors appointed by the King of Italy. There are about half a million of inhabitants. The products are many, including olives, figs, lemons, esparto grass, sponges, and ostrich feathers from the Sudan. The chief town is **Tripoli** (73), a seaport.

Eritrea has a coast-line of 670 miles on the Red Sea. The population (mainly nomadic) is about 450,000. The chief products are meat, hides, and butter. There is a pearl fishery at **Messaua**, the chief town on the Red Sea.

Italian Somaliland extends along the east coast of Africa, south of British Somaliland. It has a population of 400,000. The chief exports are hides and skins.

Spain has two small territories in Africa. The larger of the two, called **Adrar**, stretches along the coast of the Sahara south-west of Morocco. The other is a small tract in Guinea, opposite the island of **Fernando Po**, which also belongs to Spain.

Independent African States.

Abyssinia and Liberia.

There are only two countries in Africa which have not been annexed or taken under control by European powers. They are Abyssinia and Liberia.

Abyssinia, known in ancient times as Ethiopia, has a population of about 8 million. The people are Christians and Muhammadans. Nearly all of them are farmers or shepherds. The government is in the hands of an empress. The exports are hides, skins, coffee, wax, ivory, and butter. The only large town is the capital, **Addis Abeba** (15). **Gondar** was once the capital, but is now a very small town with about 3000 inhabitants.

Liberia is a republic which was formed for liberated African slaves in 1847. No white man may be a citizen. The government is on the model of that of the United States, and is vested in a President (elected), a Vice-President (elected), a Council of six ministers, and a Parliament with a Senate and a House of Representatives (elected). The electors must be negroes who are landowners. The official language is English.

The country has a coast-line of 350 miles, and extends inland for about 200 miles. The population, about 2 million, is African. About 50,000 are civilised, speak English, and are Christians. The capital is **Monrovia** (6). The United States help the people very much by taking charge of their chief departments and accounts. The exports are rubber, palm-nuts and oil, coffee, cocoa, ivory, and ginger.

78. AUSTRALIA.

THIS enormous "Island Continent" is so called because it is an *Austral*, *i.e.* southern land. Unlike the other continents, it lies wholly in the southern hemisphere. It is about three-fourths the size of Europe, being about 2400 miles from east to west and about 2000 miles from north to south.

As Australia lies wholly to the south of the Equator, its seasons are the reverse of those in Europe, *i.e.*, it has its summer in December and its winter in June (see p. 20). Also, when it is summer in Australia, the earth is *in perihelion* (see Fig. 12 and p. 16), *i.e.* it is 3 millions of miles nearer the sun than it is in winter. This makes the summer much hotter than it would be, if, as in Europe, the earth were nearest to the sun in its orbit in winter and farthest from it in summer.

The *coast* of Australia, like that of Arabia and Africa, is, for nearly its whole length, unbroken by gulfs and inlets like those of Europe which make water-ways into the heart of the continent. In the south, however, there is the wide bay called the Great Australian Bight, with the two little gulfs of Spencer and Vincent which run 200 and 100 miles inland, making good harbours, and in the north there is the almost landlocked Gulf of Carpentaria. East and west of this gulf two large peninsulas, Cape York and Arnhem Land, stretch northwards.

The **Great Barrier Coral Reef** extends for about 1200 miles along the north-eastern coast. It forms a huge natural breakwater against the great waves of the Pacific Ocean, for the sea inside it is always calm and very useful for navigation.

As to the *relief* or level of the land-surface, there are three great natural regions. These are—(1) the mountains on the east, (2) a plateau on the west, and (3) lowland plains between them.

The **Eastern Mountains**, known as the **Great Dividing Range**, stretch along the whole of Eastern Australia, from Bass Strait in the south to Cape York peninsula in the north. This long range has different names in different parts. In the south, where it is highest, it is known as the **Australian Alps**, the highest peak being Mount **Kosciusko**, 7000 feet above the sea. North of them it is called the **Blue Mountains**. The range gets its name from the fact that it is the main watershed of the continent, *dividing* the short rapid streams which flow eastward into the Pacific from the longer rivers which flow westwards into inland lakes, and south-westwards into the South Pacific Ocean.

The **Western Plateau** has an average height of about 1000 feet. On the west it falls steeply to the sea. This plateau, north and south of the Tropic of Capricorn, is a great tract of sandy land, like the Sahara and the Kalahari in Africa. As mentioned above, the heat of summer is even hotter in Australia than in N. Africa, because the earth is then nearer to the sun in the southern hemisphere.

The **Central Plains** stretch across the country from the sea on the south to the sea on the north. They slope down inwards from the Western Plateau and the Eastern Mountains till at Lake Eyre, in the centre, the land is 40 feet below sea-level. Into this lake flow a number of streams from the western slopes of the Dividing Range. The eastern half is watered by the great **Murray River** (1100 miles), which, with its tributaries, the Murrumbidgee, the Lachlan, and the Darling, is fed by the melting snows of the Australian Alps. These eastern plains are fertile. The western half is practically uninhabited.

The northern half of Australia is in the Tropics, the southern half in the Warm Temperate zone. The climate is therefore, on the whole, hot. It is also dry, except along the coast where it is maritime ; but nearly everywhere it is healthy. The rain-bearing winds, *i.e.* the south-east trade-winds from the Pacific Ocean drop their rain, from 100 to 150 inches, or the high ranges of mountains along the eastern coast, and go on blowing inland as dry winds, getting hotter as they move over the heated plains of the interior, which is therefore a rainless tract. On the north-western coast the north-west (not south-west, as in India) monsoon gives rain to that part of the country which is on the coast, and is densely wooded. The cool, moist sea-breezes blowing from the south rise high into the air as they move over the heated land, and drop no rain, for the hot air absorbs the moisture.

In many parts of Australia there seem to be, deep below the surface of the land, vast subterranean lakes of fresh water. To reach them, narrow round holes have been bored, called Artesian Wells. The water gushes up through these wells, like fountains, to the surface, and is used for drinking and for irrigating the land. Many rainless tracts have been irrigated in this way.

Australia, surrounded by vast oceans, was for long ages isolated from the rest of the world. There was no coming and going between it and other lands. Standing alone, as it did, it preserved plants and animals which once flourished everywhere, but long ago died out except in this lonely land. When Europeans first settled in Australia, about 150 years ago, they found in the country not a single tame animal; not even a wild animal related to the cow, horse, goat, sheep, or pig; no cultivated grains like wheat, barley, rice, maize, or oats. The native inhabitants were naked savages, such as lived elsewhere in the far-distant Stone Age. The animals of Australia nearly all belonged to the class of *marsupials*, *e.g.* kangaroos and opossums. The plants, too, were old-world forms such as flourished millions of years ago.

The British settlers introduced into Australia nearly all the European animals, grains, and fruit, and these have flourished and multiplied exceedingly. There are over 100 millions of sheep, horses, and cattle; and wool and wheat are now largely exported to other countries.

The total population of Australia is about five and a half millions. There are also about 60,000 natives (savages). The exports (in order of value) were wheat, wool, butter, meat, skins, and hides, minerals (gold, silver, copper, lead, tin, zinc, coal), tallow, leather, and timber—all raw material. Australia at present imports and makes its own manufactured articles and exports raw material.

THE COMMONWEALTH OF AUSTRALIA.

Australia is divided into six states, including Tasmania and two "Territories." They are Western Australia, South Australia, Victoria, New South Wales, Queensland, Tasmania, the Northern and Federal capital Territories. All these form a Commonwealth or Federal Union. There is a Federal Parliament, consisting of the King (represented by a Governor-General), a Senate, and a House of Representatives. The members are elected by the people, women as well as men voting. The Federal capital has been fixed at **Canberra** in New South Wales, but as the buildings are not yet ready the Parliament (for the present, in 1922) meets at Melbourne, the capital of Victoria. Each state has likewise its own Parliament, which deals with local matters.

NEW SOUTH WALES,

the oldest of the Australian colonies, is well watered by the tributaries of the River Murray, which forms the southern boundary. The soil is fertile. There are wide plains of grassland which afford pasture to enormous flocks of sheep. Wheat, maize, oats, and hay grow well. Horses are reared and exported to India, where they are known as "Walers." The orange, lemon, and citron are the chief fruits cultivated. Gold is found in all parts of N.S. Wales, and also silver, copper, lead, tin, and coal. The population is about 2,101,000.

Sydney (898) (in 1922), the capital and oldest town in Australia, stands on the splendid harbour of Port Jackson. It is the terminus of the steamship lines from Europe to Australia, and the chief naval station. **Newcastle** (63), like the town of the same name in England, is the centre of the coal-mining industry, and the largest coal port in Australia.

VICTORIA

is the most densely peopled state, having a population of 1,532,000. It has the best climate on the continent. The soil is fertile, the rich grasses feed great flocks of sheep and herds of cattle and horses. The wool from Victoria is said to be the finest in the world. The products are wool, gold, coal, meat, butter, hides, tallow, and leather.

Melbourne (784), the capital at the head of Port Philip, has a good harbour. It is the seat of a university.

SOUTH AUSTRALIA.

The population is about 495,000. It is the chief wheat-growing colony. Vines flourish, and very good wine is made and exported. Fruits of many kinds, chiefly oranges, grow well. The country sinks towards the north into low plains, at the bottom of which lie salt lakes, the largest being Lakes Eyre and Torrens. The chief exports are wool, wheat, and copper.

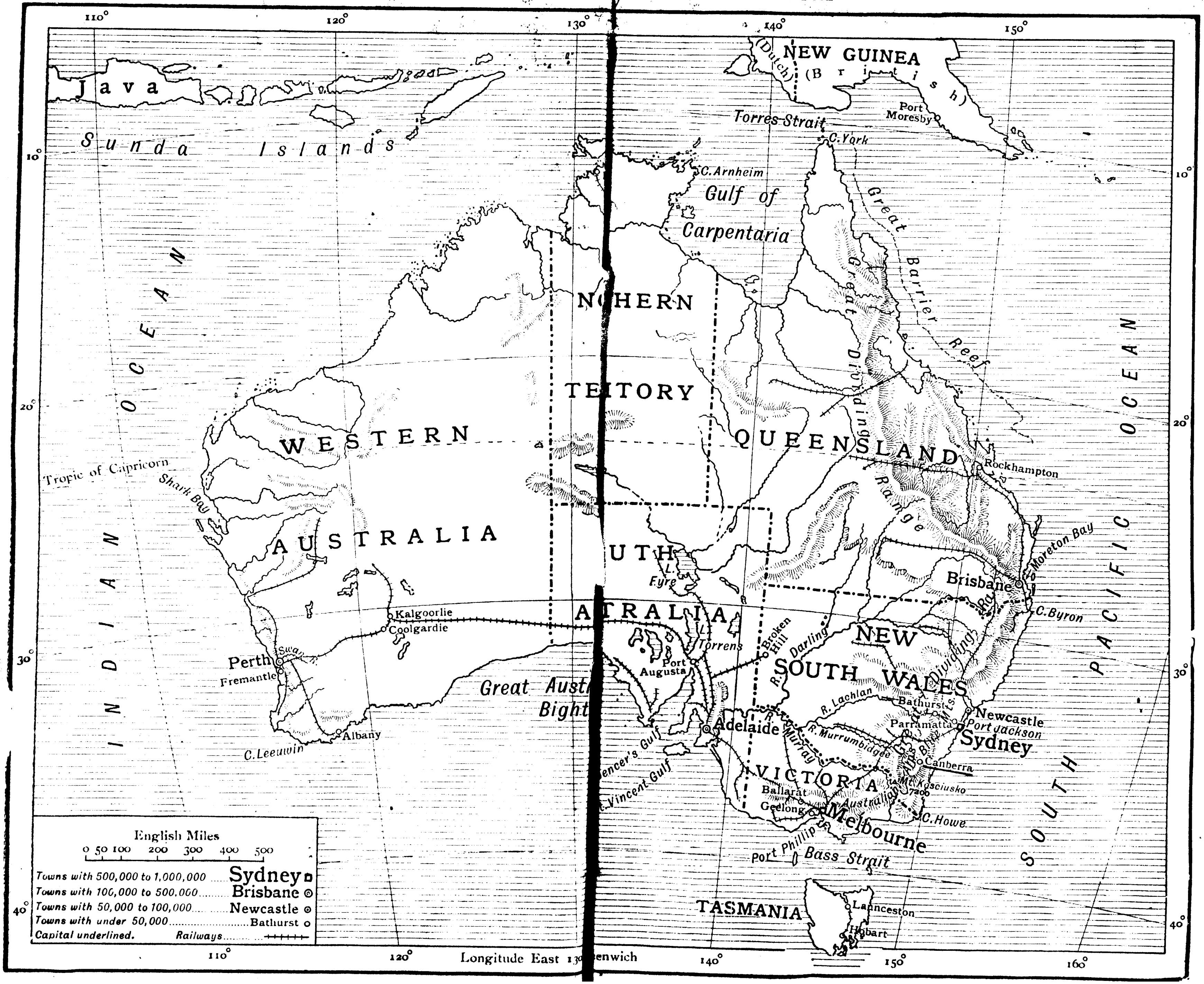
Adelaide (255), the capital, is connected by rail with Port Adelaide, 7 miles distant, on the St Vincent Gulf.

WESTERN AUSTRALIA.

This is the largest of the states, but has the smallest population, which is about 332,000. All of the interior is sandy with a climate of extremes The colonists live along the coastal plain, on which there is much fertile grass-land. The table-land slopes down to the sea westwards, and down the slope run many short rivers and streams, watering the land. In the hills there are rich mines of gold, copper, silver, and coal. The yield of gold from this state is more than that of all the other states put together. In the south-west there are thick forests with valuable timber. The *jarrah* is a very hard wood which white ants do not touch, and is therefore most useful for building purposes and for railway sleepers. The chief exports are gold, timber, wool, wheat, flour, and fruit.

Perth (155, with suburbs, including its port Fremantle, 10 miles off), the capital, on the Swan River, is the port of call for mail steamers. **Albany** (4000), connected by rail with Perth, is a large town.

AUSTRALIA: ysical & Political



QUEENSLAND

is in the north-east of Australia. The slopes of the mountains on the east afford many excellent pasture-lands and fertile fields, watered by numerous rivers and streams. The products are grain and fruit of many kinds—maize, wheat, sugar-cane, pine-apples, and melons. There are large herds of cattle and sheep. More cattle are reared in this state than in any other. The forests on the hills contain valuable timber, chiefly pine, cedar, and blue-gum. The climate is on the whole very good and free from extremes. The rainfall on the Pacific slope is heavy, being from 100 to 150 inches, but in the west from 10 to 12 inches. There are rich mines of gold, silver, coal, and copper. The chief exports are gold, silver, copper, coal, meat, hides, tallow, wool, and sugar. The population of the state is about 758,000.

Brisbane (210 with suburbs) is the capital, with large exports of wool and meat.

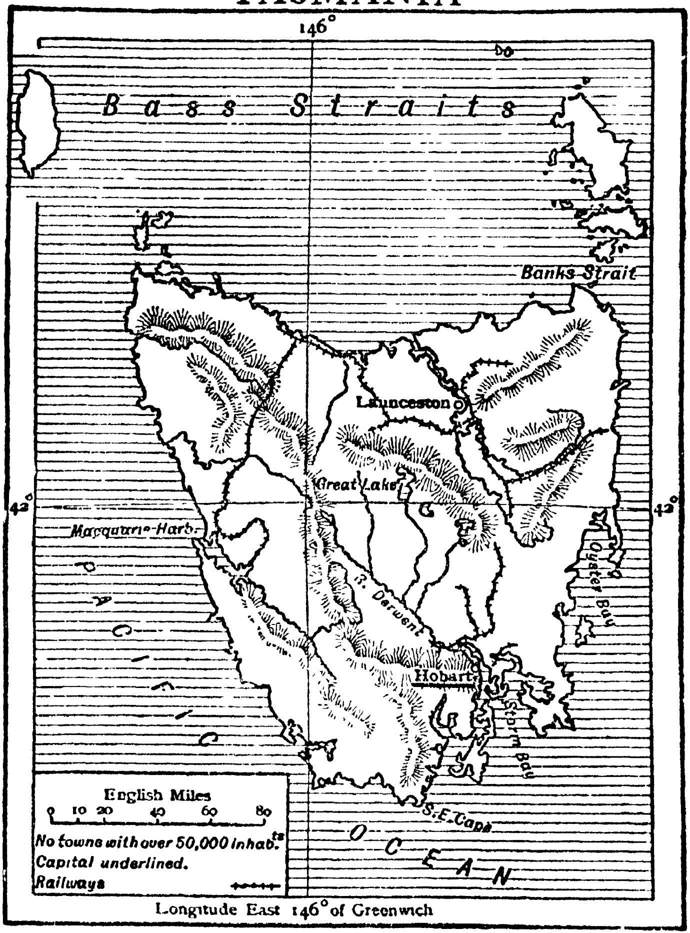
THE NORTHERN TERRITORY

is now under the control of the Commonwealth government. It comprises a large tract of country with a coast-line of 1300 miles. It has many fine rivers and several good harbours. There is a wide coastal plain along the Gulf of Carpentaria. The interior is a table-land rising to a height of 1700 feet. On it there are large areas of good pasture-land The southern region is sandy, but water can be reached by artesian wells. The climate is maritime on the coast and extreme inland. There are rich mines of gold, silver, copper, and tin. The population is at present very small, being only about 4000, and about 20,000 aborigines. **Darwin** is the chief town.

TASMANIA.

This large island, formerly called Van Diemen's Land, is now one of the states of the Commonwealth of Australia, and sends representatives to the Federal Parliament. It has its own Parliament as well. It is the smallest of the states, with a population of about 214,000.

TASMANIA



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Tasmania is separated from Australia by Bass Strait, about 140 miles wide. The interior of the island is a plateau, on which rise several ranges of mountains to a height of 5000 feet. On its surface lie many fresh-water lakes, with lovely scenery, fed by the streams from the mountains. There are many short rivers flowing down to the sea, the chief being the Derwent (130 miles). The climate is insular, and is the mildest and most equable of any part of Australasia, and one of the healthiest in the world. The growing of fruit and the making of jam are important industries. The island is rich in gold, iron ore, tin, and copper, and there are large beds of coal; it has the richest tin-mine in the world. The chief exports are wool, gold, silver, tin, timber, fruit, jam, hops, hides, and skins.

Hobart (52), the capital and chief port, is on the mouth of the Derwent. **Launceston** (26) is the chief port in the north of the island.

NEW GUINEA,

also called Papua, is a large island north of Australia, from which it is separated by Torres Strait about 90 miles wide. It stands on the Australian continental ledge, and its animals are chiefly those of Australia, showing that it must have once been a part of the continent. The interior is a plateau on which lofty mountains rise to a height of 13,000 feet. The island lies just south of the Equator, and the climate is hot but insular. There are many rivers, the chief of which, the **Fly**, is navigable for 500 miles.

New Guinea is also called **Papua** (curly haired) because of the inhabitants who have thick black curly hair. They are a wild and savage race.

On the mountains are vast forests of ebony, cedar, and india-rubber. The products of the islands are yams, bananas, cocoa-nuts, tobacco, and rubber. Gold is found in the river-sands.

The western part of New Guinea belongs to the Dutch and the south-eastern to the British. The north-eastern used to belong to the Germans, but they were driven out in the Great War by the British. British Papua is included in the commonwealth of Australia, of which it is a "Territory" ruled by a Lieutenant-Governor. The population is about 250,000. **Port Moresby** is the chief port.

WILD ANIMALS.

In Australia and New Guinea and the islands east of Wallace's Line are found some very curious animals that are seen nowhere else in the world. They are called marsupials or "pouched animals," for under the lower part of the body of the female there is a pouch of skin in which she carries and suckles her young for several weeks and even months after they are born.

Kangaroos are the largest of these pouched animals. Their front legs are very short and their hinder legs are very long, so that they cannot run on all fours but jump along on their hind legs. They have very strong stout tails, on which they partly support themselves. They go about in herds like deer. The male stands about 8 feet high, the female is about 2 feet shorter. The kangaroo can go very fast, covering 20 or 30 feet at each jump. Kangaroo skins are valuable and exported in thousands.

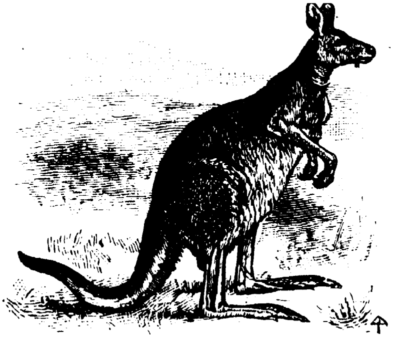


FIG. 181.—KANGAROO.

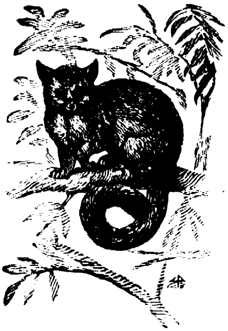


FIG. 182.—OPOSSUM.

The *Opossum* lives in trees like the opossums of America. Opossums are marsupials. They have long tails like monkeys, by which they hold on to branches. They are about as large as cats. They feed on leaves and fruit. The opossum has a beautiful soft silky skin, of which rugs are made, about three millions of skins being exported to England yearly.

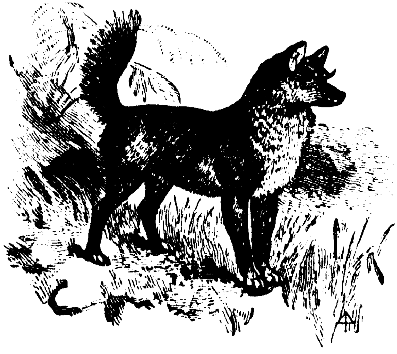


FIG. 183.—DINGO.

The *Dingo* is the only wild dog found in Australia, and it is seen in no other part of the world. It has a reddish brown coat and a bushy tail. It is very fierce, and, like the wolf and the jackal it goes about in packs. It hunts for crabs on the seashore, and, inland, feeds on small animals and birds

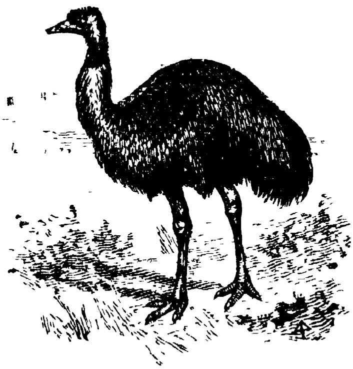


FIG. 184 —EMU

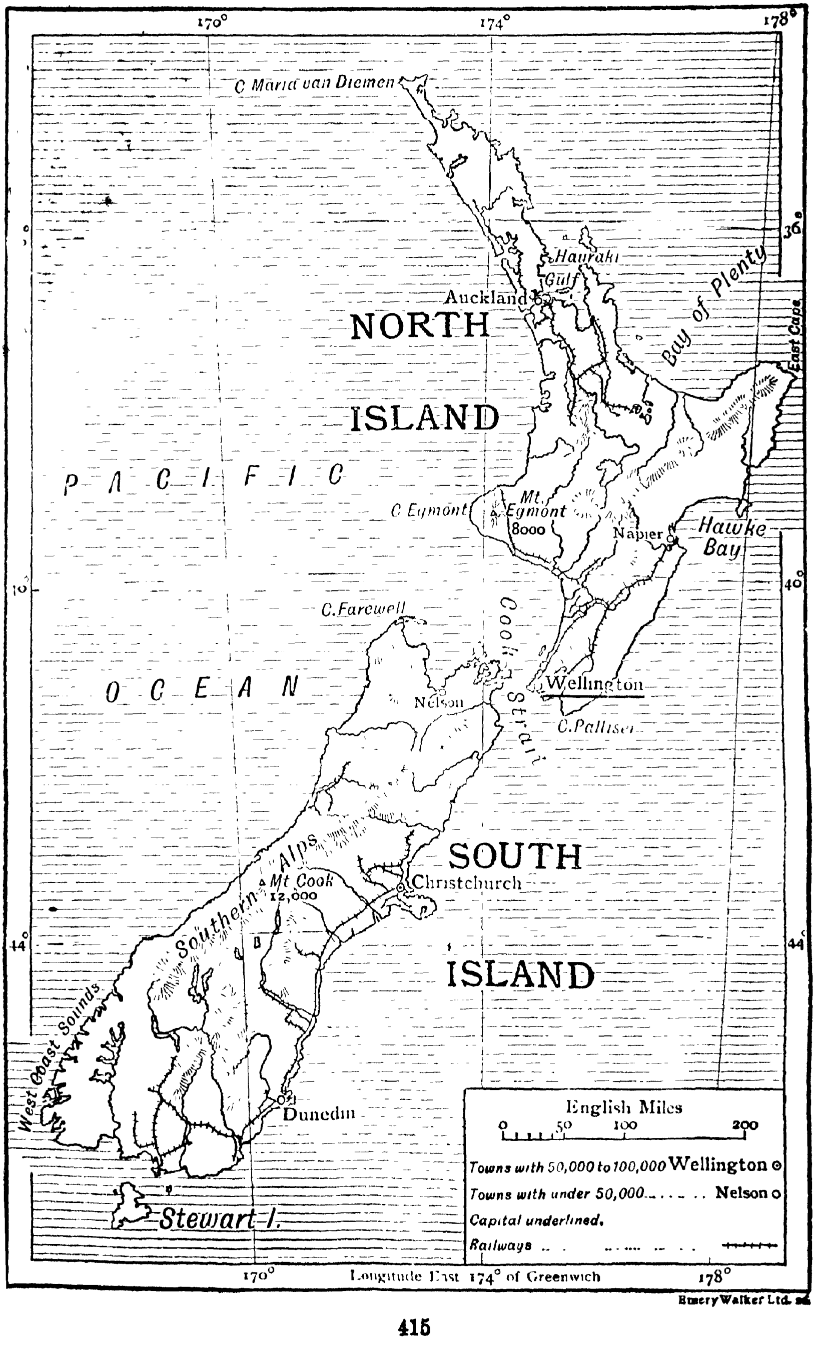
The *Emu* is the Australian ostrich. It is much smaller than the African bird, but can run nearly as fast. Emus have been so hunted that there are now very few left. They have not the same beautiful feathers that the African ostrich has. They are the largest of the Australian birds.

79. NEW ZEALAND.

THE group of islands known as the Dominion of New Zealand lies in the South Pacific Ocean, about 1200 miles S.E. of Australia. Two of these islands are much larger than the rest, and are known as North Island and South Island, each being about 500 miles long with an average breadth of about 140 miles. They are divided by Cook Strait, about 16 miles across. The Dominion is ruled by a Governor and General Assembly, *i.e.* a Parliament with two houses, a Legislative Council and a House of Representatives elected by the people, men and women voting, including Maoris.

A great range of lofty snow-capped mountains runs right through both islands from south to north. They are highest in South Island where Mount Cook rises to over 12,000 feet. In North Island the highest peak is Mount Egmont, 8000 feet. There are vast glaciers on these mountains, on which many rivers rise. The range is volcanic and contains many active peaks. There are also hot lakes and hot springs and hot pools, in which invalids bathe, for they cure many diseases, *e.g.* gout

NEW ZEALAND



170°
174°
178°
C Maria van Diemen
Hauraki Gulf
Auckland
NORTH ISLAND
Bay of Plenty
East Cape
36°
PACIFIC OCEAN
C Egmont
Mt. Egmont 8000
Napier
Hawke Bay
40°
C. Farewell
Cook Strait
Wellington
Nelson
C. Palliser
Southern Alps
Mt Cook 12,000
Christchurch
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and rheumatism. The forests are densely wooded, the chief timber tree being the gigantic **Kauri Pine**, which yields a very valuable resin or gum.

Below the mountains stretch many fertile, well-watered plains. "Throughout the islands it is scarcely possible to travel more than two or three miles anywhere without meeting a river or stream." As New Zealand lies wholly in the Warm Temperate zone the climate is warm but very healthy.

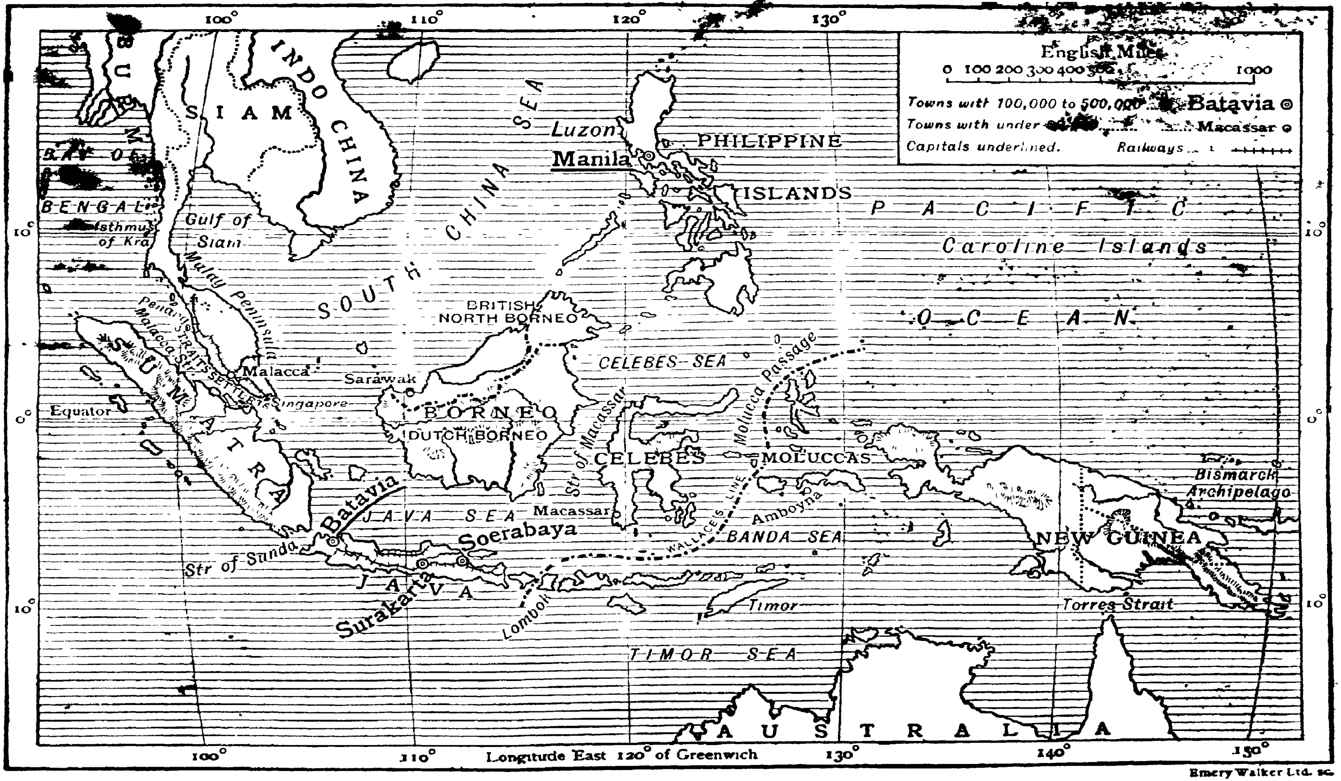
The population (1921) was 1,222,000 British and about 60,000 natives (Maoris). The chief industries are farming, lumbering, mining, and manufactures of various kind. The chief exports (in order of value) are wool, frozen meat, cheese, butter, hides and skins, gold, tallow, flax, gums, coal, and timber.

Auckland (158), at the head of Hauraki Gulf, in N. Island, is the largest city and the chief seaport in the Dominion. **Wellington** (107), in N. Island, was made the capital because of its central position. **Christchurch** (106) is a fine town with a college and museum. **Dunedin** (72), in S. Island, is a large port and the chief trading town in the Dominion.

80. THE EAST INDIES.

THE groups of islands lying between the Malay Peninsula and New Guinea, called the East Indies, are also known as the **Malay Archipelago**. The chief of them are Borneo, Sumatra, Java, and Celebes, the groups of islands called the Philippines, and the Moluccas or Spice Islands. On the map may be seen the dotted line known as Wallace's Line, after the famous naturalist A. R. Wallace. All the islands to the west of this line have plants and animals like those in Asia (*e.g.* the tiger, elephant, rhinoceros, and monkey), showing that they once formed a part of Asia. The islands to the south of this line are known as Melanesia and Australasia. They have plants and animals like those of Australia, showing that they

EAST INDIES


English Miles
0 100 200 300 400 500 1000
Towns with 100,000 to 500,000 Batavia
Towns with under Macassar
Capitals underlined.
Railways
100°
110°
120°
130°
140°
150°
10°
0°
10°
Longitude East 120° of Greenwich
BURMA
BAY OF BENGAL
Isthmus of Kra
SIAM
INDO CHINA
Gulf of Siam
Malay Peninsula
Penang
STRAITS SETTLEMENTS
Malacca Str.
Malacca
Singapore
SUMATRA
Equator
SOUTH CHINA SEA
Luzon
Manila
PHILIPPINE ISLANDS
PACIFIC OCEAN
Caroline Islands
BRITISH NORTH BORNEO
Sarawak
BORNEO
DUTCH BORNEO
CELEBES SEA
Str of Macassar
Molucca Passage
CELEBES
MOLUCCAS
Macassar
Amboyna
WALLACE'S LINE
BANDA SEA
JAVA SEA
Batavia
Soerabaya
Str of Sunda
JAVA
Surakarta
Lombok
Timor
TIMOR SEA
NEW GUINEA
Bismarck Archipelago
Torres Strait
AUSTRALIA
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once formed a part of that continent. Most of the islands are volcanic with many active peaks. They all lie within the Tropics. The Equator (see Map) passes through them. There is therefore a heavy rainfall of over 100 inches in the year, and the climate is hot and damp. The whole archipelago is a Dutch possession, with the exception of the Philippines which belong to the United States, N. Borneo. which is British, and Timor, which belongs to Portugal.

The products of all the islands are very much the same. On the hill-slopes grow coffee, tea, cinchona, spices, rubber, and gutta-percha ; and in the plains sugar-cane and tobacco.

JAVA

is the most important of the Dutch possessions. It is the most fertile, the best cultivated, and the most thickly peopled island in the East Indies. It measures about 600 miles from west to east. There are more volcanoes in it than in any other country of equal size in the world, many of them being from 9000 to 12,000 feet high. The population is about 36 million, chiefly Malays and Chinese and Arabs, all Muhammadans. The exports are sugar, coffee, tea, rice, indigo, cinchona, tobacco, copra, and tin.

Batavia (138), the capital and centre of trade, has a good harbour. **Soerabaya** (150), the largest town in Java, and **Surakarta** (118), are important commercial towns and capitals of Malay protected States.

SUMATRA,

an island about 1000 miles long and 300 broad, is divided from the Malay Peninsula by the straits of Malacca. There are high mountains in the centre and a low coastal plain. The chief products are coffee, tobacco, pepper, and gutta-percha ; also camphor and beeswax. The population is about 5 million, nearly all Malay Muhammadans.

BORNEO,

the largest island in the archipelago, is the third largest in the world; the north-western part is under British protection and is administered by a British Company with a charter like the old East India Co. The population is about half a million. The country of **Sarawak**, in Borneo, is under an English rajah named Brooke. It is a strip of country along the coast about 400 miles long, with a population of about half a million. The products of the island are chiefly gutta-percha, rubber, coffee, pepper, and tobacco. It produces more sago than any other country in the world.

CELEBES,

a large island belonging to Holland, has a population of 2½ million. *Macassar*, on the southern peninsula, is the busiest mart in the archipelago. All the trade of the eastern islands, including New Guinea, passes through it.

The **Moluccas**, or Spice Islands, are so named because they have been for centuries famous for their cloves, nutmegs, and cardamoms. They belong to Holland. Nearly the whole of the world's supply of nutmegs comes from the Moluccas. **Amboyna,** the capital, is a large military station.

THE PHILIPPINE ISLANDS

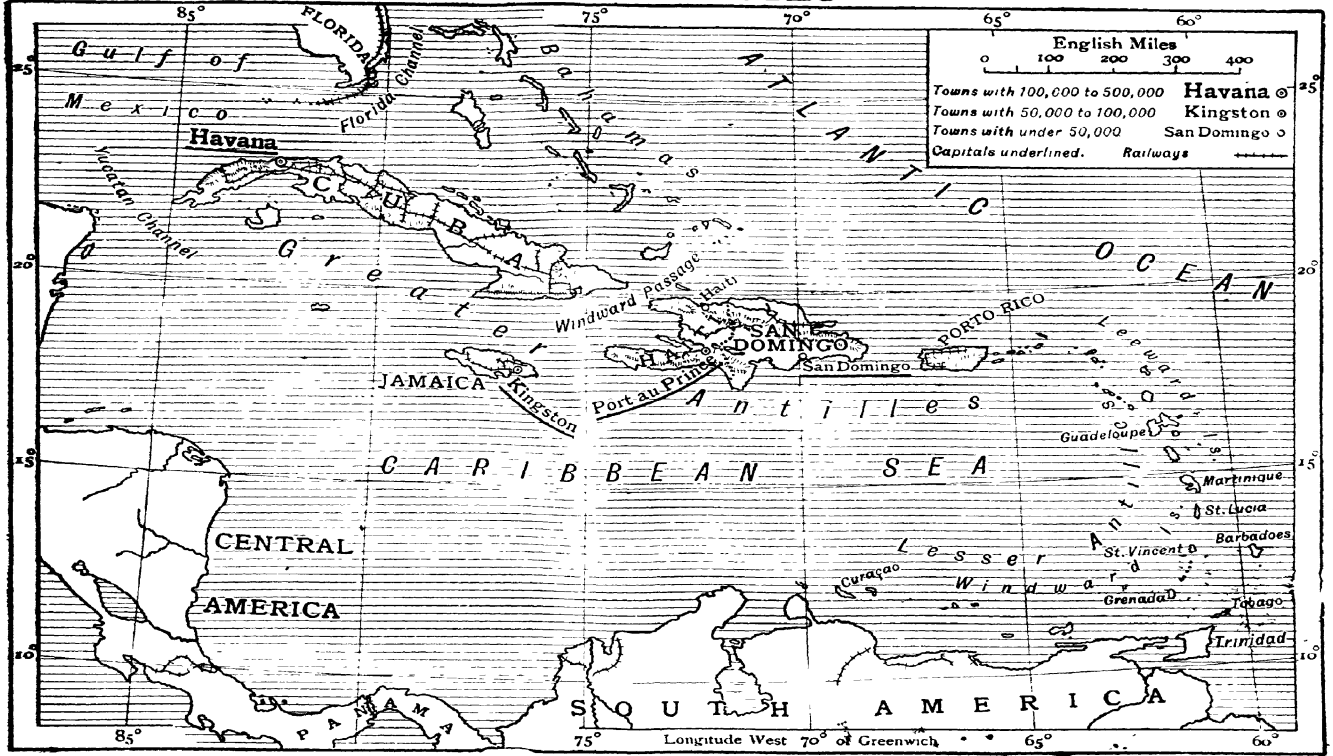
are about 3000 in number, the largest being Luzon. The population is about 10 million, mostly Malays The capital city is **Manila** (284), famous for its cigars. The chief products are rice, hemp, cocoa-nuts, sugar, maize, and tobacco. The forests contain valuable timber, gum, and dye-woods. Gold is the chief mineral.

81. THE WEST INDIES.

THE West Indies include a long line of hundreds of islands which rise from the sea to the east of Central America, making a sort of breakwater in front of the Gulf of Mexico and the Caribbean Sea. These islands are of all sizes, from Cuba, nearly twice as large as Ceylon, to tiny rocks just rising above the sea.

They were probably formed, like the Andes, by volcanic

WEST INDIES



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action. Numerous active volcanoes are found in the West Indies, and fearful earthquakes often occur in which thousands of people lose their lives.

All the islands lie within the Tropics, and the climate is therefore wet and warm. But as the sea lies all round, the climate is also maritime and equable.

There are no large rivers. Much of the land is fertile, and in some islands very rich; in others, *e.g.* the Bahamas, it is mostly barren. All tropical fruits and vegetables grow well, especially the sugar-cane, also the banana or plantain, pine-apple, arrowroot, and tobacco. In the forests are found mahogany, logwood, and other valuable trees.

The British West Indies include (1) the Bahamas, (2) Jamaica, (3) the Leeward Islands, (4) Trinidad with Tobago, (5) Barbados, (6) the Windward Islands.

To Holland, Denmark, and France belong a few of the smaller islands. Cuba is an independent republic. Porto Rico belongs to the United States of America.

Cuba. the largest of the West Indies, has a population of 2,890,000. The products are sugar-cane, tobacco, bananas, coffee, maize, oranges, pine-apples, and cocoa-nuts. Cuba produces more cane-sugar than any other country in the world. **Havana** (364), the capital, is the largest town in the West Indies, and is famous for its cigars. **Jamaica**, with 858,000 inhabitants, is one of the finest of the tropical islands. The soil is fertile. The products are sugar, rum, bananas and oranges, cocoa-nuts, logwood, coffee, and cocoa. **Kingston** (57) is the capital. The **Bahamas** are coral islands, and produce a little fruit, hemp, and sponges. **Barbados** produces sugar, rum, and cotton. **Trinidad** has a population of 397,000, produces sugar and cocoa and cocoa-nuts. Asphalt or pitch is obtained from a lake in the island. The chief of the **Windward Islands** is St. Vincent. Excellent cotton, arrowroot, sugar, rum, and cocoa are the products. In the **Leeward Islands** is Montserrat, where lime-juice is made and exported.

82. EUROPE.

EUROPE is naturally divided into two parts, each very different from the other. Eastern Europe, *i.e.* Russia, is a continental plain. Western Europe is a land of peninsulas.

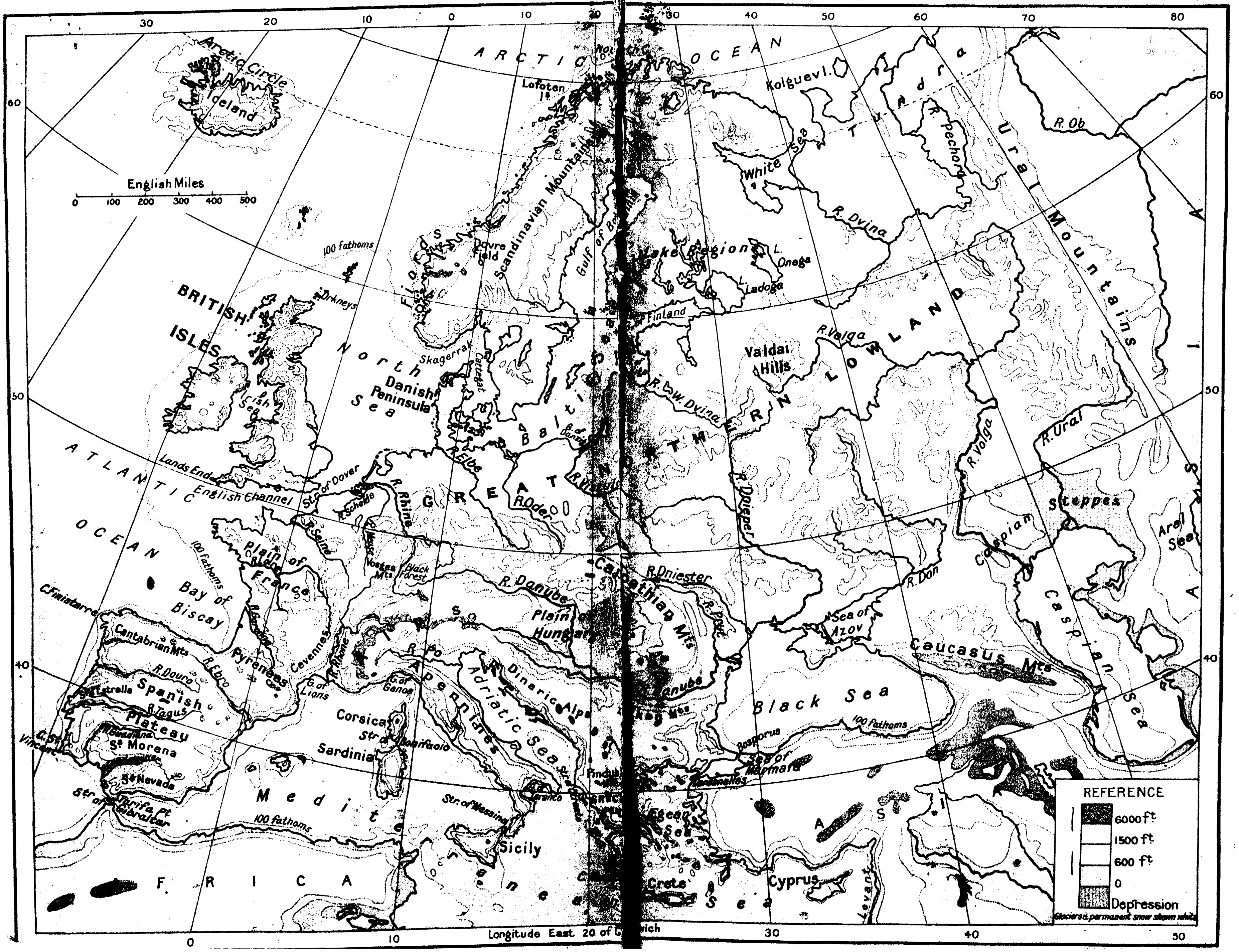
The coast-line of Europe is therefore longer, in proportion to its size, than that of any other continent. Seas or bays or gulfs run up far into the land. Many rivers flow down into these seas, making waterways into the heart of the continent. *Trade* from one part of Europe to another, and *commerce* with other lands, are more easily carried on than in any other part of the world.

This peninsular or insular shape of the western countries of Europe has been of enormous importance to the nations which inhabit them. The nearness of the sea has given to most of them a temperate climate; it has made many of them into merchants and sailors with large fleets of trading vessels and powerful navies; it has civilised them by the intercourse they have been able to hold with all parts of the world; it has enriched them by interchange of goods in trade and commerce; it has fed them from the fisheries in the seas which surround them. As a consequence, these nations are the richest and strongest in the world. They now rule or control most of the nations of the Old World, and the descendants of European races inhabit or rule all the countries in the New World. In a similar way, and for the same reasons, the insular position of Japan has made it one of the great powers of the world.

The "relief" of Europe, *i.e.* the different heights of the surface of the land, is clearly shown in the coloured physical map, No. 17. Looking at this map we see three different levels of the land; there are low plains (coloured green), higher plateaus (coloured yellow), and still higher hills and mountains (coloured brown), the highest being dark brown.

The great northern plain extends for nearly 2500 miles from the Bay of Biscay through Russia to the Ural Mountains.

EUROPE—PHYSICAL



The long blocks of ancient plateaus were once probably great mountain ranges. Most of them have been worn down by the weather—the action of ice, snow, hail, rain, running water, and wind, working on them age after age—to plateaus of very hard rock at different levels, as a rule below 500 feet in height.

The belts of higher hills and mountains which rise to the south of the plateau land from the Bay of Biscay to the Black Sea, and to the Caspian Sea beyond it, all belong to one system, to which the name *Alpine* has been given. The system includes the Pyrenees, the Alps (with Mont Blanc, 15,775 feet), the Carpathians, the Balkans, and the Caucasus (with Mont Elburz, 18,526 feet). The Apennines and the Dinaric Alps on both sides of the Adriatic Sea, and the Sierra Nevada in Spain, are offshoots from the same system of folded mountains.

The *Rivers* of peninsular Europe are divided by the great watershed of the continent—the highlands which extend from west to east—into those which flow north from those which flow south. The rivers of the Spanish peninsula flow westward. The great rivers of Continental Europe, *i.e.* of Russia, rise, nearly all of them, in the Valdai Hills and flow southwards. The names of all these rivers, the countries which they water, and the seas into which they flow may be seen on Maps 17 and 18.

CLIMATE.

As nearly the whole of Europe lies within the Temperate Zone, the climate is, on the whole, temperate. The continent extends northward for about 2500 miles from the Mediterranean Sea, and therefore the countries in the south, those along the Mediterranean Sea, lying in the *Warm* Temperate Zone, are warmer than the countries in higher latitudes in the *Cool* Temperate Zone.

There is another reason for the mild climate of the Mediterranean countries. Most of the great ranges of mountains, *e.g.* those of the Alpine system, run from west to east. They protect the countries lying south of them from cold northern winds. The Alps, *e.g.*, shelter Italy, as the Himalayas shelter the valley of the Ganges, from the icy blasts from the north. On the other hand, as few mountain ranges run from north to south, the western winds can blow far into the interior of the country between the ranges running from west to east. These westerly winds from the warm Atlantic Ocean bring warmth and moisture into the countries of Western Europe. As we go from west to east, away from the Atlantic Ocean, the climate is less and less maritime and more and more extreme, for the influence of the warm westerly breezes grows less and less. On the other hand, the great range of the Scandinavian mountains, running for 1000 miles from north to south, shuts out the warm Atlantic winds from the countries of Sweden and Lapland, which lie to the east, making these countries much colder than they would be if these mountains were not there.

As to the *rainfall*, it is heaviest on the mountain ranges along the western coasts of Great Britain, Norway, and Spain, and on the ranges of the Alpine system in Central and Southern Europe. It diminishes as we go eastward, and in the south-east of Russia it is less than 8 inches in the year.

Vegetation.—The zones of vegetation numbered 4 to 8 in Lesson 59 are all found in Europe. Below the region of ice and snow in the far north, in the Arctic Circle, come the *Tundras.* The extreme north of Russia, including Lapland, is Tundra land. The next zone is that of the *Conifers* the Pine, the Fir, and a few Birch trees. Coniferous forests stretch right across Scandinavia and northern Russia, where the chief industry of the people is "lumbering," *i.e.* felling the trees, and floating the logs down the rivers to saw-mills where they are sawn into planks.

South of the Conifers is the zone of *Deciduous*[1] forests, which includes most of the countries of Central Europe. Here the trees are the Oak, the Birch, the Beech, the Ash, and the Elm. The leaves of these trees fall off in autumn, so that in winter the boughs are bare. Where the rainfall is very small, as in south-eastern Russia, trees cannot grow, and we find a region of *Steppes* to the north of the Caspian Sea

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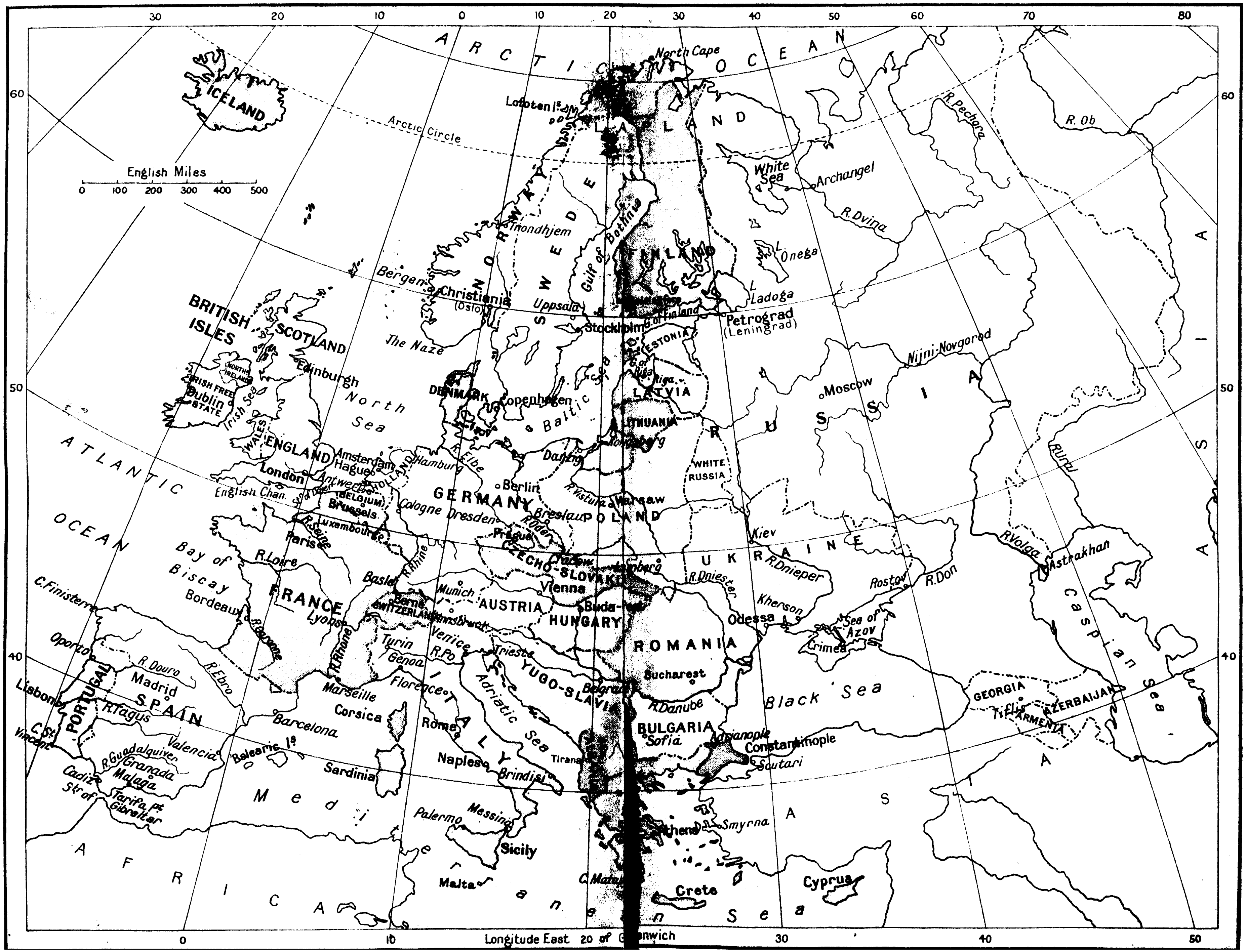
[1] Latin. *De* = from + *cad* = fall.

EUROPE—POLITICAL



The Steppes are wide stretches of grass-land on which large flocks and herds of cattle graze. The chief occupation of the people of the Steppes is the rearing of cattle. They live in tents, and wander from place to place in search of good pasture-land. In some of the Russian steppes there is enough rain to grow large crops of wheat (which is merely a cultivated grass). In the countries along the Mediterranean Sea many of the trees are *Evergreen*. The most valuable plants in this region are the Vine and the Olive, which are grown nearly everywhere.

Products (vegetable).—The *Grains* most largely cultivated are Rye and Oats in the north, Wheat in Central and Southern Europe, and Maize in the Mediterranean region. *Beet*, from which sugar is made, is very widely cultivated in Central Europe. *Flax* is grown chiefly in Russia. *Timber* trees are grown chiefly in Sweden, Norway, Russia, and Austria-Hungary. *Fruit* trees are cultivated everywhere. Oranges and lemons, olives and figs, grow best in the Mediterranean countries. The *Potato* is very widely grown and used for food.

Products (animal).—*Wool* is produced chiefly in the British Isles, Russia, and Germany. *Silk* is a product of northern Italy and France. *Fishes* abound in the shallow parts of the North Sea and the Mediterranean, and are one of the chief sources of food in many European countries. *Butter, eggs,* and *cheese* are produced largely in Holland and Denmark.

Manufactures.—The manufactures of any country depend chiefly on whether coal is found in it, particularly near iron. The countries which export manufactured goods most largely are Great Britain, France, Belgium, Germany, and Switzerland. In all these countries but Switzerland coal and iron are found.

Minerals are found in great abundance in Europe. In nearly every country there are mines of coal, iron, copper, lead, and salt. *Tin* is found in Great Britain, *Zinc* in Belgium and Germany, *Mercury* in Italy, Spain, and Austria-Hungary, *Sulphur* in Italy.

Animals.—Domesticated or tame animals are found in every country in Europe. Some of them are used for riding or for drawing carts or for ploughing, *e.g.* the horse, the ass, and the mule; some for milking, as the cow and the reindeer; some for food, including cattle, sheep, pigs, and poultry. Very few of the larger wild animals now exist in Europe, although in ancient times they abounded in the forests.

WILD ANIMALS.

The *Polar Bear*, also known as the White Bear, is one of the largest of the Bear tribe. It is 9 feet long and weighs from 800 to 900 pounds. Yet it is very active and can run faster than a man. It swims very well, and lives on fishes and porpoises and seals and walruses. It has a thick oily skin covered with fur, which keeps it from getting wet. Its home is a cave in the ice.

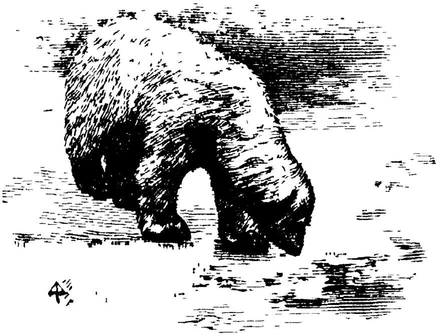


FIG. 185.—POLAR BEAR.

The Seal.—Seals are not fishes although they live chiefly in the sea, swimming and diving like fish. They are warm-blooded animals and suckle their young. They are covered with a thick oily skin through which water cannot pass, and over it they have a thick warm coat of fur. They have broad webbed feet with which they swim. They live in the ice and snow, and catch and eat fishes. Hunters kill a great many of them every year for their skins, which are very valuable.

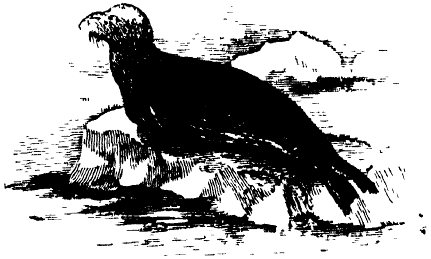


FIG. 186.—SEAL.

The *Walrus* is one species of seal. It is not found outside the Arctic Ocean. It is a huge creature, being 12 or 13 feet in length, and weighs nearly a ton. It differs from all other seals in having two long powerful tusks. With them it digs in the ice and sandy mud for shell-fish; with their help it climbs over the ice; with them, too, it fights if attacked.

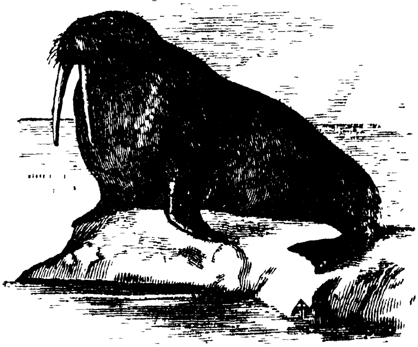


FIG. 187.—WALRUS.

The *Arctic Fox* is smaller than the common fox, and in winter its coat of fur turns quite white, so that it cannot easily be seen on the snow. It feeds on sea-birds and their eggs, and anything else it can find. It has a soft white fur which is valuable, and many hunters in the far north of Europe, Asia, and America are always busy catching foxes in traps or shooting them.

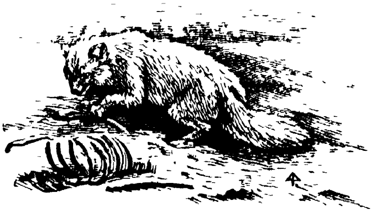


FIG. 188.—ARCTIC FOX.

The *Sable* belongs to the same tribe as the Indian mungoose It is found in the far north of Europe. It is about a foot and a half long, and has a beautiful coat of fur which in winter is quite white. It is also found in the far north of Asia and America. It lives in the trees, and is found only in some parts of the southern tundra where low trees are found. It lives on mice, small birds, and eggs. Sables are hunted for their furs.

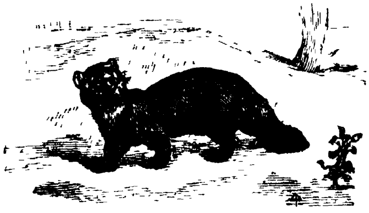


FIG. 189.—SABLE.

The *Reindeer* is the only variety of the deer tribe which has been tamed and used by man. It is found in the north of Europe, Asia, and America. Without its help man could not live in those dreary regions. Large herds are kept, as cattle are kept in other countries. Reindeer live on moss, which they scrape out of the snow with their hoofs. The Laplanders and tribes of N. Siberia drink their milk, and travel about from place to place on sledges drawn by their deer

FIG. 190.—REINDEER.

The *Chamois* is very much like the ibex of Asia. It is a little mountain antelope about two feet in height, and has short black horns. It is one of the most active of living animals, leaping from rock to rock and skipping up and down steep cliffs where no other animal can get a foot-hold. It lives in herds, on the Alps, an old buck always keeping watch on a high rock while the rest of the herd feed.

FIG. 191.—CHAMOIS.

The *Brown Bear* is found chiefly in the low wooded hills of Russia and in parts of Central Europe. It goes about in pairs, not in herds. It feeds chiefly upon roots and fruit and wild honey, but will also eat flesh and sometimes catches and kills small animals. It can climb trees easily. In cold countries it goes to sleep

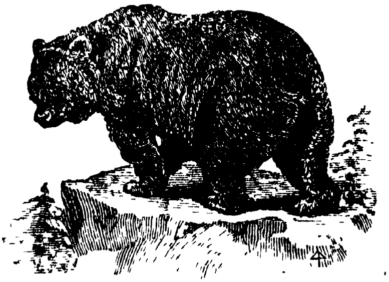


FIG. 192.—BROWN BEAR.

all the winter, in a hole which it digs for itself in the ground.

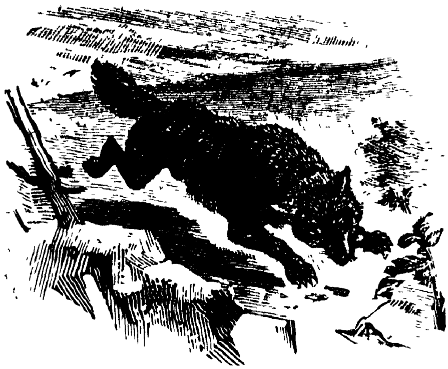


FIG 193.—WOLF.

The *Wolf*, too, is found chiefly in Russia. Wolves go about in large packs, and in winter they get very fierce and bold, and hunt for men who may be travelling across the country, because there are no animals at that season to be found in the forest where they live. They are held in much dread by the Russian villagers.

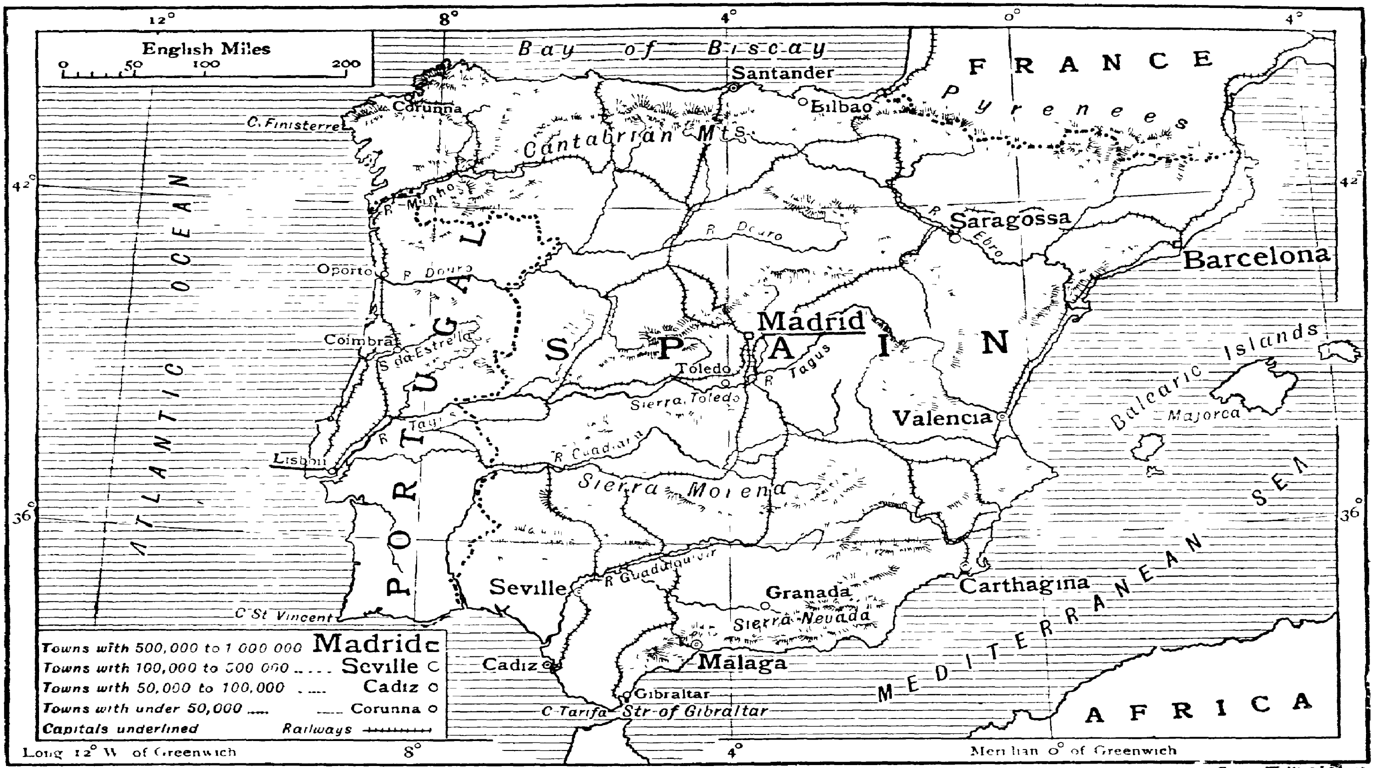
83. SPAIN AND PORTUGAL

SPAIN and Portugal together make up the Iberian Peninsula, a huge plateau, which is crossed by high ranges of hills called Sierras (Saws), from the jagged edges of their long summit lines. On the plateau the climate is extreme, with cold winters, hot summers, and a scanty rainfall of less than 20 inches in the year.

The plateau slopes from east to west, and five of the six large rivers marked on the map flow in this direction, through deep narrow valleys, between the Sierras, into the Atlantic Ocean. They are (from north to south) the **Minho**, the **Douro**, the **Tagus** (566 miles), the **Guadiana**, and the **Guadalquivir.** These rivers flow so rapidly and are so shallow that all but the last are nearly useless for navigation or even for irrigation. The Guadalquivir (374 miles), however, is navigable from Seville to the Ocean. The sixth river, the **Ebro** (470 miles), flows through the north-east of Spain into the Mediterranean, across fertile plains which it irrigates.

The **Pyrenees** divide Spain from France. They are a lofty range of folded mountains rising to 11,000 feet, and are continued

SPAIN & PORTUGAL



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in the **Cantabrian** Mountains along the Atlantic coast. The **Sierra Nevada**, in the south, rises still higher along the Mediterranean coast to 11,700 feet. The Sierras of the plateau are the **Sierra da Estrella** (in Portugal), the **Sierra Toledo**, and the **Sierra Morena**.

The eastern Mediterranean region produces in abundance oranges, olives, nuts, raisins, sugar, rice, cotton, and tobacco. On the western slopes of the hills facing the Atlantic grow fine grapes from which wine is made. On the plateau "esparto grass" is grown for paper-making.

Minerals abound in the mountains of Spain. Iron of very good quality is found around Bilbao in the north, and is largely exported to Britain. The copper mines of Rio Tinto in the Sierra Morena are the largest in the world. There are great coal-fields in the north, in the Cantabrian Mountains, and famous quicksilver mines on the northern slopes of the Sierra Morena. Silver, lead, and zinc are also mined.

Spain.—The *population* of Spain (in 1919) was about 21 million. The industries of the country are *mining*, where metals are found, especially in the north where there is a large supply of coal and iron ; *fishing* along the sea-coast ; the *grazing* of sheep (which give the well-known Merino wool) on the hills ; *farming* (wheat, barley, oats, rye, maize, and millets) and *fruit growing* in the Mediterranean region ; and *manufactures* of cotton and silk goods, of paper, and leather in many of the large towns, *e.g.* Barcelona. The *Government* is a constitutional monarchy under a King, and Parliament called the Cortes, with two Houses; a Senate (nobles), and a Congress elected by the people.

Madrid (609), the capital, is a nodal town, being the centre of the railway system. **Barcelona** (582), the chief seaport, on the Mediterranean, is the largest manufacturing town in Spain, and the outlet for the produce of the fertile valley of the Ebro. **Valencia** (236), on the east coast, is a seaport with much trade in wine and fruit. It is the chief seat of the silk industry. **Seville** (151), on the Guadalquivir, is the second port in Spain. Seville oranges are well known everywhere. **Malaga** (137) is a large seaport on the south coast with great trade in fruit and wine. **Carthagena** (103), on the south-east coast, is the chief naval port of Spain. **Cadiz** (63) is a strongly fortified naval harbour. **Granada** (77) is the basin of the Guadalquivir, an ancient town famous for the Alhambra, a splendid building erected by the Moors when they ruled the country. **Saragossa** (118) is a large river port on the Ebro, and the largest town in the basin of that river. It has a splendid cathedral, to which pilgrims come from every part of Spain. **Gibraltar** (18), which belongs to the British, is the Key to the Mediterranean Sea. It is built on a very strongly fortified rocky hill, about 1400 feet high, which runs about three miles out into the sea. It is known as "the Rock." Its great guns command the Straits of Gibraltar, here 12 miles wide. The opposite coast of Africa may be clearly seen across the straits. It has a splendid harbour in which a large fleet can anchor, and is one of the chief coaling stations of the British Navy.

Portugal.—The little country of Portugal includes the coastal plain watered by the Minho, the Douro, and Tagus, and the western slopes and crests of the plateau up to a height of 7000 feet. The Sierra da Estrella divides northern from southern Portugal. About six-sevenths of the population live in the northern part.

The most important products are wine and cork. Cattle are reared on the hills, and wheat, rye, and maize are grown in the fields. Olives, figs, and tomatoes are also cultivated.

The *population* of Portugal was about 6 million in 1911.

Government.—Portugal is a Republic (formed in 1911). There is a Parliament with an Upper Chamber elected by all the Municipal Councils, and a Lower Chamber elected by the votes of the people. The head of the Government is a President, elected by both Chambers.

Lisbon (490), on a wide estuary of the Tagus, has one of the best natural harbours of the world. All the trade and commerce of the country pass through it. The chief export is wine. **Oporto** (204) is at the mouth of the Douro, which waters a fertile valley in which grapes grow abundantly. It is the second town and port of Portugal for the export of wine.

Coimbra, midway between Oporto and Lisbon, has the only University in Portugal. It has the heaviest rainfall in Europe.

84. FRANCE.

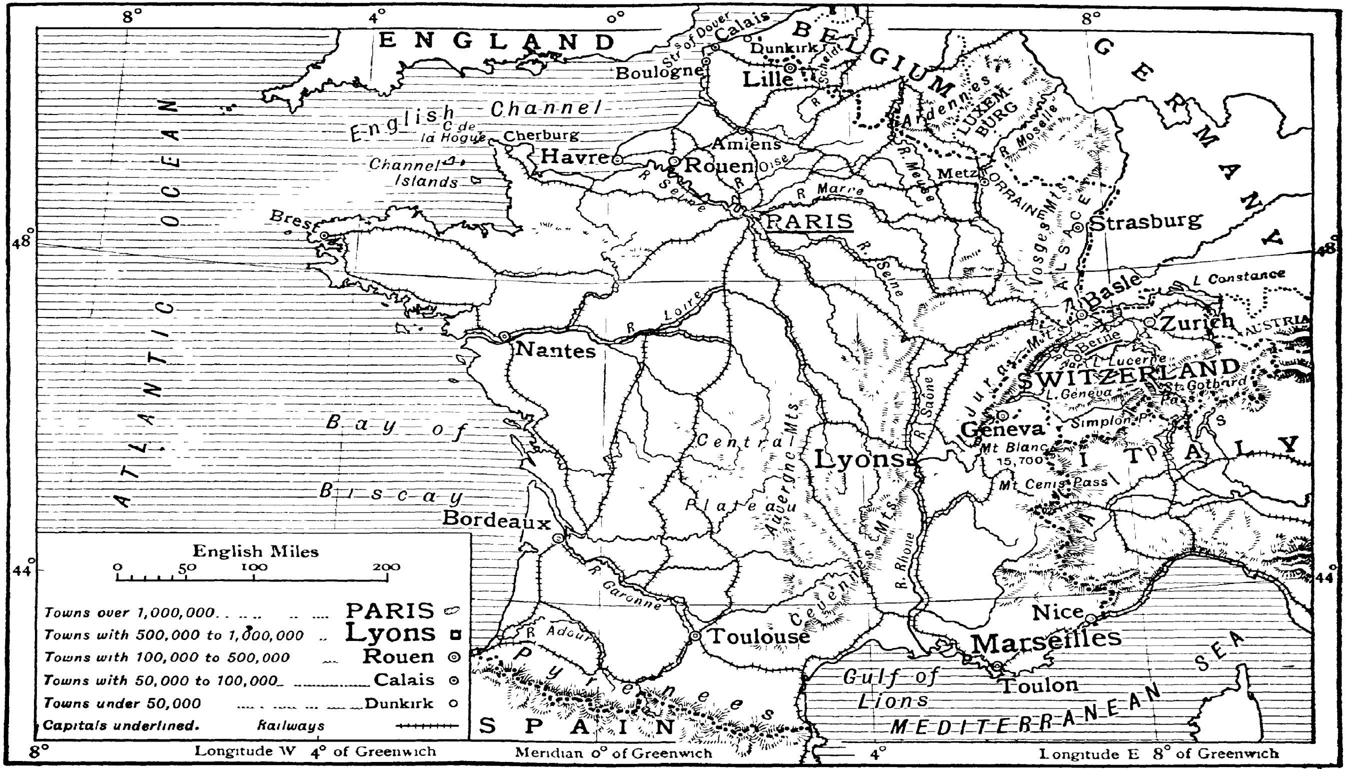
France is naturally divided into two regions. All the north and west of the country is a fertile well-watered plain, lying open to the warm westerly breezes from the Atlantic. The centre, the south, and the east are made up of plateaus, hills, and mountains. On the central plateau rise the mountains of Auvergne to a height of 6000 feet, and to the south-east the Cevennes (5600 feet). The deep valley of the Rhone separates the plateau from the Alps, the western slopes of which, including Mont Blanc (15,800 feet), are in France. North of the Rhone valley rise the **Jura** Mountains (5000 feet) and the **Vosges** Mountains (4000 feet), forming a natural boundary between France and Germany. On the south the Pyrenees (6000 to 10,000 feet) divide France from Spain.

The four largest rivers of France are the Loire (540 miles), the Rhone (504), the Seine (480), and the Garonne (535). At the mouth of each of these rivers there is a large seaport town, which is the gate through which exports and imports pass.

The climate of the greater part of France is pleasant. The north and west are warmed by the breezes from the Atlantic, the southern part by breezes from the Mediterranean. The mean annual rainfall is about 30 inches.

The south-eastern corner is very fertile, and has been called the Garden of France. Here the orange, the olive, and the mulberry flourish. On the mulberry leaf, silk-worms feed. Silk is one of the chief exports of France. The principal crop of the country is *wheat*; France grows more wheat than any other country in Europe. The crops in order of value are—potatoes, wheat, oats, beetroot, rye, and barley. The *Vine* grows very well in the river basins and on the slopes of the hills. The wines of France, both red and white, are more largely drunk than those of any other country. Fruit-trees grow everywhere,

FRANCE & SWITZERLAND



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e.g. the apple, the pear, the peach, and the plum. Flax is largely cultivated in the north-eastern plain.

Industries.—In northern France *Woollen* and *Cotton Goods* are manufactured, for the ports on the Atlantic are well placed for the import of cotton and wool from abroad, and sheep thrive on the northern plains. *Silk* is made in the valley of the Rhone. *Iron* and *Steel Goods* are made in the north-east, where there are coal-fields. *Wine* is made wherever the vine grows. Watches, jewels, ribbons, lace, gloves, hats, and articles of dress are made in Paris. *Fishing* employs many men on the coast. From these fishermen sailors for the French merchant ships and Navy are taken.

Government.—France is a Republic, under a National Assembly or Congress. The executive power is in the hands of a President, and the legislative power rests with the Senate and the Chamber of Deputies, elected by the people.

The *population* in 1921 was 39,210,000. There are fifteen towns with over 100,000 inhabitants, and thirty-three more with from 50,000 to 100,000.

Paris (2906), the capital, on the Seine, is the second city in Europe in size and the most beautiful. The map shows that it is a great nodal town. Railways run to it from all parts of France. **Marseilles** (586), at the mouth of the Rhone, is on the Gulf of Lyons. It has a splendid harbour and is the first port in France. It has enormous trade and large manufactures, the chief of which are soap and oil. All the exports and imports of the valley of the Rhone pass through it. **Lyons** (562), at the junction of the Rhone and its chief tributary the Saone, has the largest silk manufactures in the world. **Bordeaux** (267), at the mouth of the River Garonne, has great trade in wine (Claret), being the centre of a land of grapes. **Lille** (201), in the centre of the north-east coal-field, is a large town with manufactures of iron and steel goods, rails, engines, and glass; also flax and hemp. It is on the frontier of Belgium and is strongly fortified. **Toulouse** (175), in the south, on the River Garonne, has much trade with Spain, into which two lines of railway run, one at each end of the Pyrenees. **Nantes** (184) is a seaport at the mouth of the Loire. All the produce of the rich valley of that river comes to it for export. **Havre** (163), at the mouth of the Seine, is the second port of France. It imports coffee from Brazil and wheat from North America; and exports most of the manufactured goods of Paris. **Rouen** (121), on the Seine, is the centre of the cotton manufacture. The tides come up the Seine as far as Rouen, making it a seaport. **Calais, Boulogne,** and **Dunkirk** are seaports on the Channel, with daily steamers to England. **Cherburg** and **Brest** are strong naval ports. **Nice** (156), on the Mediterranean coast, is a beautiful town, to which many invalids go for its warm, pleasant climate.

85. SWITZERLAND.

THIS little inland State, half the size of Ireland, is the highest country in Europe. It has been called the "playground of Europe," for thousands of visitors go to Switzerland from all parts of the world to breathe the pure mountain air, to climb the hills, to skate on the ice, and to sail on the lakes.

Amid the Alps stands Mt. St. Gothard. Here four rivers rise, each on a different slope, and flow north, south. and west. They are the **Rhone**, which flows west into France; the **Rhine**, which flows north into Germany; the **Aar**, which also flows north and joins the Rhine; and the **Ticino**, which flows south and joins the Po in Italy. Each of these rivers has cut out for itself a deep valley bed, down which it rushes with great force. The Swiss use the fall of water in these rivers, and many other smaller streams, to turn the wheels of their machines and to generate electricity. Thus, although there is neither iron nor coal in their country, they manufacture a great many useful articles for export. All these articles, *e.g.* watches and jewellery, are small and costly and require much labour and great skill to work up, but little raw material, so that the cost of carriage is small.

The Alps have very lofty peaks. **Mont Blanc** (15,800 feet) in France, **Monte Rosa** (15,000 feet) in Italy, and the **Matterhorn** (14,800) in Switzerland, are the highest. There are railways carried through the Alps and under them in tunnels, or long holes cut underground. The **Simplon** tunnel, the longest in the world, is 12 miles long, the Gothard tunnel is 9½ miles long. The climate is intensely cold. In the deep valleys and on the central plateau it is warm and pleasant. Nearly all the large towns are on the plateau. On the lower slopes of the hills there is very rich pasture, and numbers of cows graze. Milk (condensed), cheese, and butter are exported in large quantities. The shepherds carve toys out of wood while tending their flocks. Grapes are grown on the slopes of the Jura Mountains; flax and hemp on the northern plateau, also potatoes, oats, and rye.

The lakes of Switzerland are Lake **Constance**, through which the Rhine flows; the Lake of **Geneva**, through which the Rhone flows; and Lakes **Zurich** and **Lucerne**.

The population of Switzerland is 3,900,000. The Government is a Federal Republic. There is a Parliament with a President and Vice-President. There are 22 districts called *cantons*. Each has its own local government.

Zurich (207), at the head of Lake Zurich, the largest town, has a great silk-weaving industry, the third in Europe after Lyons and Milan. It is a great road and railway junction. **Basel** (136) is the gate to the Rhine valley. It is the chief railway centre. Silk ribbons are the chief manufactures. **Geneva** (135) is the outlet for the produce of the valley of the Rhone, on which it stands, where the river leaves Lake Geneva. Here watches, jewellery, and lace are largely made. **Bern** (105), the capital city and seat of the Federal Council, is on the River Aar, and owes its importance to its situation in the centre of the Swiss plateau.

86. ITALY.

ITALY is the central peninsula of Europe. It has three natural regions, viz. the valley of the Po, the long narrow peninsula with the Apennines running down the middle of it, and the mountainous island of Sicily.

The fertile **valley of the Po** is about 350 miles from east to west. The Alps shelter it from cold northerly winds, so that the climate is warm and pleasant. Olives and mulberries grow well, and enormous numbers of silk-worms are reared. The country is well irrigated; there is now an annual *rice* crop to the value of 40 millions of rupees. Other large crops are flax and hemp. Cattle are reared in numbers, and excellent cheese is made for export. As in Switzerland, great use is made of water-power from the many rapid streams rushing down from the Alps, owing to the want of coal.

There are beautiful lakes in North Italy, in the outer valleys of the Alps. The three largest are **Garda**, **Como**, and **Maggiore**. They are all very deep, being the lowest parts of the valleys of rivers which flow through them.

The Peninsula Proper.—The region of the Apennines is about 700 miles long with an average width of about 150 miles. The sea goes nearly all round, so that no part of this country is more than 60 miles from the sea. The climate is maritime, and pleasant and healthy everywhere, except in the marshes on the western coast near Rome where it is very malarious and feverish. The sunny slopes of the Apennines, which rise to 7000 feet, are covered with vineyards. The olive, orange, and lemon are grown extensively. The grain crops are wheat and maize.

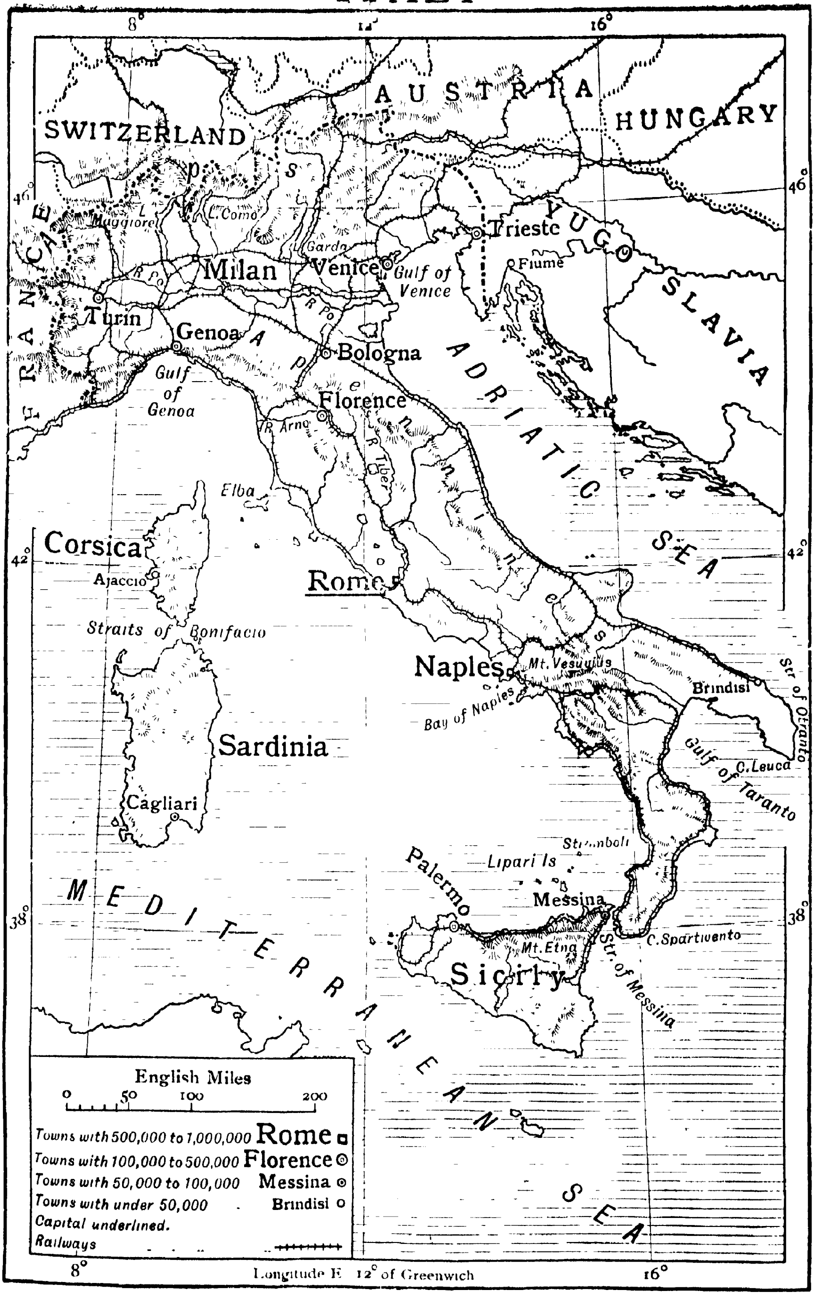
Two unpleasant winds sometimes blow, the icy "mistral" from the Alps, and the scorching "sirocco" from the Sahara.

The *population* of Italy is about 40 million. Nearly all Italians are Roman Catholics, which is nominally the *State religion.* The "Supreme Pontiff," or Head of this Church, is the Pope of Rome, and his palace is the "Vatican." The *Government* is a limited monarchy under a King and Parliament of two Chambers—a Senate and a Chamber of Deputies.

There are fifteen towns with over 100,000 inhabitants, and seventeen more with over 50,000.

Naples (698), the largest city, on the beautiful Bay of Naples, has great trade and manufactures of silk, glass, musical

ITALY



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instruments, and carving in coral. Near it is the volcano Vesuvius (Fig. 37). **Rome** (591), on the River Tiber, is built on seven little hills. It is the most famous city in the world, and was the capital of the great Roman Empire 2000 years ago. It has many splendid churches and palaces and ancient buildings. The Church of St. Peter is the largest Christian church in the world. **Milan** (663), on the Po, in the middle of the great plain, is a nodal town (see Map), a great railway centre, and the chief industrial town of Italy. **Turin** (452), on the Po, is another nodal town. Passes over the Alps connect it with France on the north, and roads and railways through the Apennines with the port of Genoa on the south. It is a great manufacturing (wool) and trading town. **Palermo** (346), the capital of Sicily, is a city on a beautiful bay, and has a large export of oranges, lemons, and olives. The lofty volcano **Etna** is behind it. The sulphur from this volcano is a valuable article of export. **Venice** (168) stands on 120 islands close to the land, in the Gulf of Venice. Here boats move noiselessly from house to house along canals, for there are no roads, no carriages, no dust. Venice is the most silent city in the world. It has large commerce and many industries. **Genoa** (300) is the first port in Italy. It has a fine harbour, and exports nearly all the produce of north-western Italy which comes to it by rail. **Florence** (242) "the beautiful" stands on the Arno in the heart of Italy, on the slope of the Apennines. **Bologna** (190) commands the route on the east coastal plain from north to south. **Cagliari** (61), the capital of the mountainous island of Sardinia which belongs to Italy, has a good harbour, and exports grain, flax, cheese, silk, and wine. The island has rich deposits of iron, lead, zinc, and marble.

87. HOLLAND (THE NETHERLANDS).

HOLLAND is the lowest part of the great plain of Northern Europe. Nearly one-half of it is 30 feet below the level of the North Sea, which is only kept from rushing over the land and drowning it by huge sea-walls called dykes, faced with great blocks of granite, which have been built along the shore and are kept in careful repair.

The coast of Holland includes the mouths of three busy rivers—the Rhine, the Maas, and the Scheldt. This makes it the "Ocean gate for Central Europe." Through it must come all the products of the lands to the south, and from it these products are exported in Dutch ships and steamers. The Dutch import and then export tobacco, sugar, cacao, coffee, spices, and drugs. They also export sugar, woven goods, butter, cheese, gold and silver, and import grain (for food), iron, steel, coal, and wood (for their manufactures). They are good gardeners and dairymen. They grow roots of all kinds, beet and potatoes and flowers, and make large quantities of cheese and butter.

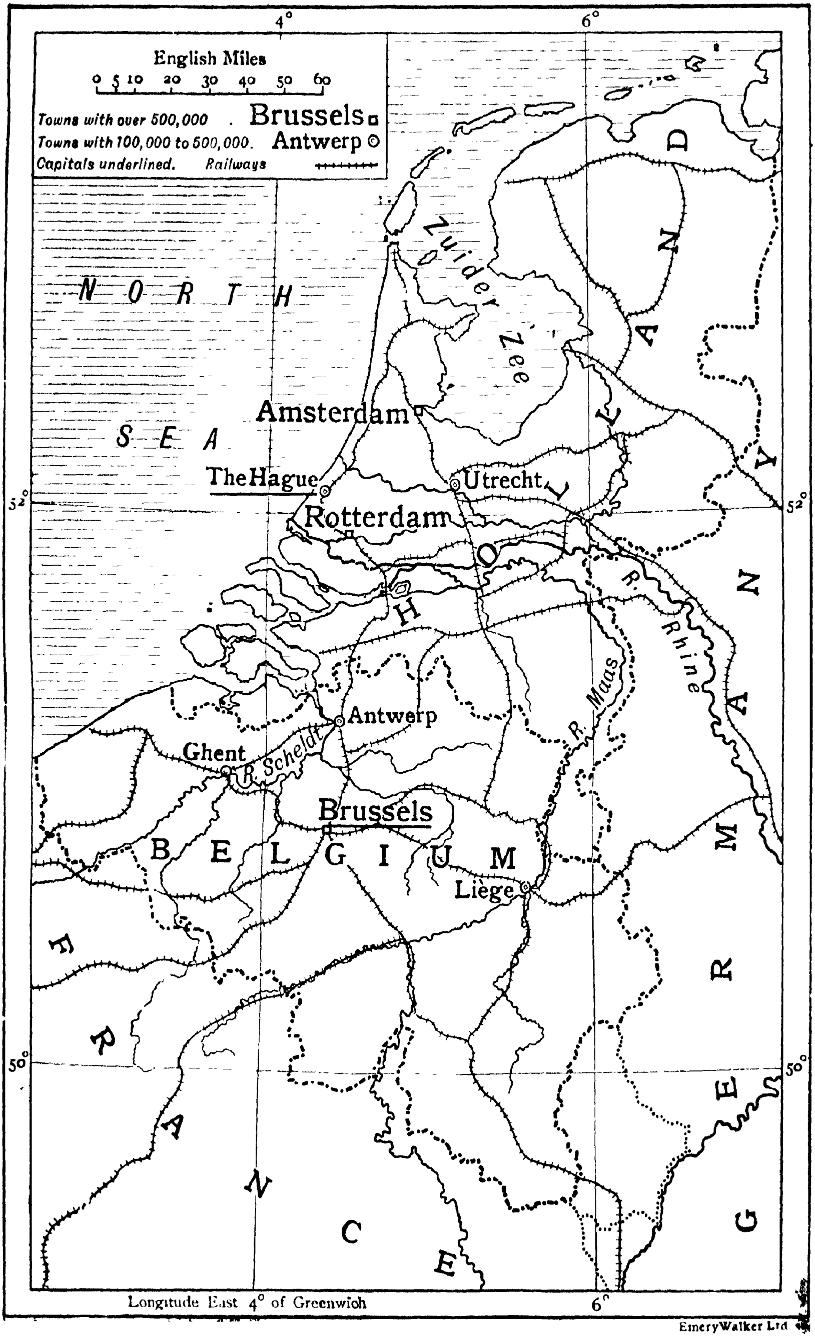
The Government is a limited monarchy, now under a Queen. The legislative power rests in the Sovereign and a Parliament known as the States-general. The people of Holland and their language are called **Dutch**. The population numbers 6,900,000. There are four towns with over 100,000, and eight more with over 50,000.

Amsterdam (642), the capital, on the shore of the Zuider Zee, is connected by a deep canal with the North Sea ship-canal. It is a city of canals, which divide it into 90 islands connected by hundreds of bridges. It is a great centre of commerce (tobacco and coffee), and famous for its diamond cutting. **Rotterdam** (511), on the River Maas or Meuse, close to the mouth of the Rhine, is the first seaport and chief commercial city. It is full of canals. Its situation, helped by the ocean, rivers, and canals, makes it one of the first harbours of the world. **Utrecht** (140) is a large nodal and manufacturing town. The **Hague** (353) is the capital town and the centre of the industries of the country.

88. BELGIUM.

BELGIUM, like Holland, is a part of the great plain of Northern Europe. It lies (see Map 18) between Germany and France. So many great battles (*e.g.* Waterloo) have been fought in it

HOLLAND & BELGIUM



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that it has been called the "Battlefield of Europe." The Great Powers of Europe long ago agreed that this little country should not be touched, but in the deadly War of 1914–18, the Germans broke their solemn word and treaty, invaded Belgium, and laid waste the whole country. The English and French, however, came to their help and, after fighting hard for over four years, drove the invaders out.

As in Holland, the North Sea is kept back from the northern coast (40 miles long) by dykes or sea-walls. The River Scheldt, with its many tributaries, waters the northern plain, and the Maas (Meuse) the southern highlands. There are numerous canals everywhere. The highlands have rich mines of coal, iron, lead, and zinc, and this makes Belgium a great manufacturing country, with large cities filled with factories, in which iron and steel goods are made as well as cotton goods, linen, and lace. The soil is not good, but it is very carefully cultivated and well manured, and yields crops of oats, rye, potatoes, wheat, and beetroot. The other imports are raw material for the factories, chiefly wool, flax, and cotton.

Belgium is the most densely populated country in Europe. The population is about 7½ million. The Government is a limited monarchy under a King and Parliament, including a Senate and Chamber of Representatives.

Brussels (685), the capital, is a fine city, with many splendid buildings.

Antwerp (334), on the Scheldt, 60 miles from the sea, can be reached at high tide by large ocean steamers. It is one of the great ports of Europe where ships are built. The chief industries are sugar-refining and lace-making.

Liège (165), on the Meuse, is the chief industrial town in Belgium. It has been made by the coal-fields. Its factories turn out fire-arms in great quantities. **Ghent** (166), on the Scheldt, is the chief seat of the cotton manufacture.

89. GERMANY.

DIRECTLY the War was over, in 1918, the Emperor of Germany abdicated and fled into Holland. Germany then became a Republic. It now includes eighteen independent States, each having its own ruler. By far the largest of these States, with about two-thirds of the whole population, is Free State Prussia in the north. The next in size are Bavaria, Würtemberg, Baden, and Saxony.

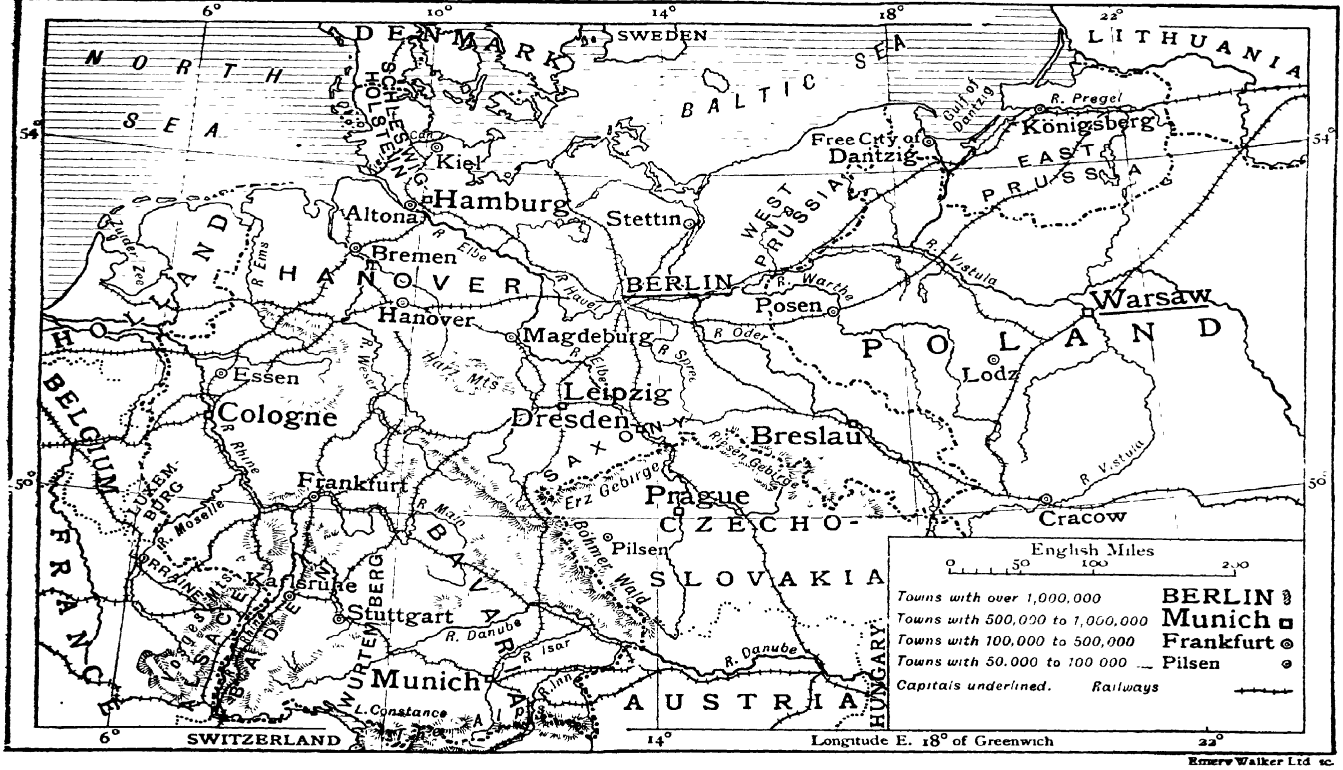
The two great natural regions of Germany are the northern lowlands and the southern highlands. The latter include the slopes of a part of the Alps, the Harz Mountains, the Black Forest, the Bohemian Forest (Bohmer Wald), the Ore Mountains (Erz Gebirge), and the Giant Mountains (Riesen Gebirge).

There are five great rivers, viz. the Rhine, the Weser, Elbe, the Oder, and the Vistula. The first three flow into the North Sea, the last two into the Baltic. The upper course of the Danube also is through Bavaria, Würtemberg, and Baden in the south of Germany. The **Rhine** (810 miles) is by far the most important waterway in Germany, and enormous traffic passes up and down the river. It has three great tributaries—the **Main** (305 miles), the **Mosel** (320 miles), and the **Neckar** (246 miles). The valley of the upper Rhine is the most fertile part of Germany. As these rivers flow slowly across the great plain, they are all navigable; and the flat surface of the land has made it easy to dig canals which connect them. For the same reason it has been easy to make railways. Germany is covered with railways, and there are many canals. The **Kiel Canal** runs from the North Sea to the Baltic. Steamers use it instead of sailing all round Denmark.

The climate of western Germany, which is reached by the Atlantic winds, is mild and moist. This is the valley of the Rhine and its tributaries. Eastern Germany has a dry and extreme climate.

Forests cover about one-fourth of the land, and they are carefully worked and preserved. In the highlands there are valuable mines of coal, iron, zinc, lead, silver, and copper,

GERMANY and POLAND



These metals and minerals have made Germany a great industrial nation. About one-third of the population is employed in manufactures. The chief industries are the making of iron and steel goods; paper; woollen, linen, cotton and silk goods; chemicals, dyes, beet-sugar, glass, and pottery; the brewing of beer, and the carving of wood. The imports are chiefly raw wool, raw cotton, skins, copper, wheat, coffee, barley, tobacco, rice, maize, and eggs

The chief crops are, in the Rhine valley, wheat and barley, hops and tobacco and grapes. In other parts of the country grow oats, rye, beetroot, and potatoes.

The population is about 60 million. There are many very large towns in Germany, one town with over a million, six with over 500,000, sixteen more with over 200,000, twenty-five more with over 100,000, and thirty-eight more with over 50,000.

Berlin (3800), on a branch of the Elbe, is the capital. It is a great nodal town (see Map) with railways running in every direction. Quite half of the population are employed in factories. **Hamburg** (986) is the greatest seaport on the continent of Europe. **Munich** (631), on the Isar, a branch of the Danube, is the capital of Bavaria. It is a nodal town (see Map). More beer (the German national drink) is brewed here than in any other town in the world. **Leipzig** (604), on a branch of the Elbe, in Saxony, has, after Berlin, the largest (inland) trade in Germany. It is the great centre of the book trade. **Breslau** (528), on the Oder, in Prussia, is the centre of trade with the countries to the east of Prussia. **Dresden** (530), on the Elbe, is the capital of Saxony, with large manufactures. **Cologne** (634) is a great nodal town on the Rhine. **Frankfurt** (433), on the Main, a tributary of the Rhine, is a river port, and the railway and banking and trade centre of western Germany. **Magdeburg** (286), on the Elbe, is a very strong fort, and is the centre of the trade in beet-sugar. **Hanover** (310) is the capital of the State of Hanover. **Stuttgart** (309), on the Neckar, a tributary of the Rhine, is the capital of Würtemberg, and the centre of the book trade of south Germany. **Stettin** (233), at the mouth of the Oder, is the port of Berlin, and has much shipbuilding and great trade in sugar and grain. **Konigsberg** (261), in East Prussia, a port on a bay of the Baltic Sea, exports flax, hemp, and potatoes. **Bremen** (258), a seaport at the mouth of the Weser, "imports more tobacco and rice than any other town in the world, and more cotton than any other town in Germany."

90. CENTRAL EUROPE STATES.

THESE are Poland, Czecho-Slovakia, Austria, and Hungary.

The chief *Mountain Ranges* are —the **Carnic Alps**, between Austria (Tyrol) and Switzerland; the **Dinaric Alps**, along the coast of the Adriatic; the **Carpathian** Mountains, which extend in a great curve of 1000 miles around the north and east of Hungary, rising from 6000 to 9000 feet, and are prolonged into the **Transylvanian Alps** on the south-east of Hungary. All these belong to the Alpine system.

The wide *Inland Plain* is Hungary, the basin of the Middle Danube. The coastal plain on the Adriatic includes the little peninsula Istria.

The Danube (1700 miles), the second river in Europe, fed by the melting snows of many mountains, is, in its middle course, the great river of Austria and Hungary. Its upper course is in Switzerland, and its lower course through the Balkan States. It flows into the Black Sea. Its chief tributaries are the Drave (450) and the Save (450) (from the Alps) on the right bank, and the Theiss (from the Carpathians) on the left bank. The "Iron Gate" (see Map) is a deep, narrow, rocky gorge which for 70 miles divides the Transylvanian Alps from the Balkan Mountains.

The chief crops are, in Austria, rye and oats; in Hungary, wheat and maize. Other crops are potatoes, beetroot, barley, hemp, hops, and tobacco. The vine grows well on the mountains of the Alps and Carpathians, and good wine is made.

The mountains are covered with great forests, which yield much valuable timber. They are rich in *minerals*, especially in

Bohemia, where coal and iron are found in abundance. There are also mines of silver, lead, quicksilver, and zinc. There are great salt-mines in Galicia and also petroleum. The main occupation of the people is agriculture. The *industries* (especially near the coal-mines) are the manufacture of woollen, linen, cotton, and jute goods; also glass (Bohemia) and beer. The chief *exports* are sugar (beet), eggs, timber, glass, malt, and woollen goods.

POLAND.—The State of Poland comprises that part of the plain of Europe which is drained by the rivers Vistula and Warthe (a tributary of the Oder). Poland possesses a small strip of coast-line on the Baltic Sea, but Dantzig (200), at the mouth of the Vistula, is a Free city. The Poles, like the Russians, belong to the Slav race, and they now have an independent government. Agriculture employs a large number of people, barley, oats, rye, and sugar-beet being grown; sheep-farming is also important. In southern Poland pines and beeches cover the lower slopes of the Carpathians.

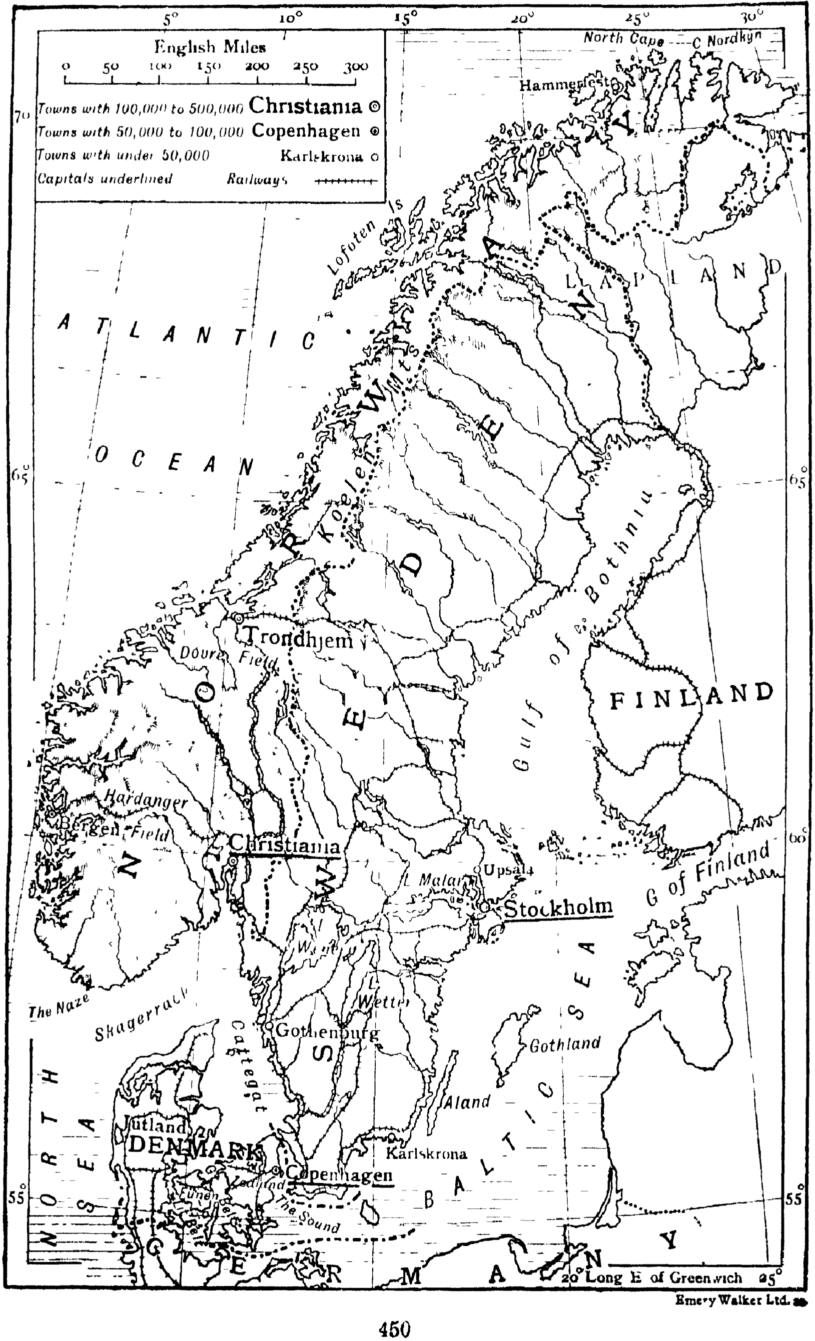
Warsaw (820), the capital, is situated on the navigable Vistula; it is also a great railway centre. **Lodz** (423), south of Warsaw, is an industrial town where cotton and woollen goods are made, and near it is a productive coal-field. **Cracow** (176), on the Vistula, is the old capital of Galicia. In the neighbourhood of Cracow are the famous mines for rock salt. Petroleum is also obtained in Galicia. **Pozen**, on the Warthe, is an agricultural town.

CZECHO-SLOVAKIA.—The Czechs and Slovaks, like the Poles, belong to the Slav race. The Czechs live mostly in Bohemia and Moravia, and before the Great War were subject to Austria. The Czechs are the most highly educated of all the Slavs, and the University of Prague was founded by them. The Slovaks, who were subject to Hungary, have joined the Czechs to form the government of Czecho-Slovakia. The Slovaks occupy a mountainous country which is rich in minerals. The western part (Bohemia) is surrounded on three sides by mountains (Bohmer Wald, Erzgebirge and Riesengebirge) and it is drained by the Elbe and its tributaries. Many people are engaged in agriculture, sheep-farming, and timber-cutting. Coal is mined near Prague, hence many manufactures are carried on, such as glass and paper. **Prague** (616), on the Moldau, is the seat of government. **Pilsen** is noted for the manufacture of beer. **Brunn**, in Moravia, manufactures woollen goods.

AUSTRIA is now a small country without a coast-line. In consequence of the war Austria lost many provinces, *e.g.* Bohemia in the north, Trentino in the south. Austria includes a part of the Danube valley, of which the land round Vienna forms a fertile plain. The rest of the country is very mountainous and thickly forested. The western part is called the Tyrol, a province noted for the beauty of its scenery. Innsbruck is the chief town in the Tyrol. East of the Tyrol the mountains are rich in minerals, especially coal, iron, lead, mercury, and salt. **Vienna** (2150), the capital of Austria, has an important position on the great trade routes which cross Central Europe; it commands the passage between the mountains known as the Austrian Gate, a route leading into Bavaria. Furniture, paper, fancy goods, and textiles are all made in Vienna. **Graz** and **Klagenfurt** are noted for iron and steel goods.

HUNGARY consists for the most part of a low-lying plain crossed by the Danube and its tributary the Theiss. As the Danube crosses the plain of Hungary it is liable to overflow its banks, and embankments have been made to keep the water within the proper channel. The soil of the plain is very fertile, and excellent crops of wheat, rye, barley, and maize are obtained. Hungarian flour is noted for its superior quality. Large parts of the plain are used for pasturing horses, cattle, and sheep. The towns are nearly all agricultural centres. The people are called Magyars, a race descended from Asiatic stock. **Buda-Pest** (880) is the capital of Hungary. The Magyar town of Pest grew up on the left bank of the Danube, opposite to the older town of Buda; the two towns are connected by bridges. The railway which crosses Central Europe passes through Vienna and Buda-Pest on its way to Constantinople.

NORWAY, SWEDEN, DENMARK.



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91. SCANDINAVIA.

The great peninsula of Scandinavia gives its name to the mighty range of mountains which, for a length of about 1200 miles, rises steeply from the depths of the Atlantic Ocean to a plateau 4000 feet in height with peaks on it rising 4000 feet higher. The coast is about 6000 miles in length, broken all along the western side of the peninsula by deep *fiords* which run far into the land, some of them for 100 miles with a depth of 2000 to 4000 feet, forming splendid water-ways into the heart of Norway. The water in them is calm and deep, and opposite to them, along the coast, lie hundreds of small rocky islands, the largest group being the Lofoden islands. These fiords are natural harbours for the sailors and fishermen who people the coast. The huge glaciers on the snow-clad mountains feed numberless short and rapid streams, and the waterfalls supply water-power to the Norwegians instead of coal. The northern section of the mountains is known as the **Koelen** (Keel) mountains, for they look to the sailors like the keel of a boat turned upwards.

The climate of Norway is very different from that of Sweden, although both countries are, more or less, in the same latitude. The climate of the western coast of the peninsula is maritime, with rain all through the year, especially in winter. The westerly winds from the Atlantic bring warmth and rain to Norway, while the mountains shut out the icy eastern winds. But the eastern coast (Sweden) gets no westerly winds, and is exposed to the full force of the easterly winds from the wide plains of northern Russia. The climate is therefore continental. The ports of Sweden on the Baltic are frozen every winter, but the fiords of Norway are never frozen. **Bergen** (see Map) on the west coast has five times as much rain as **Upsala** on the east coast, both towns being in about the same latitude (60° N.).

Norway.—The Government is a limited monarchy under a King, who commands the land and sea forces. The legislative power rests in the Storthing or Parliament, which is elected by the people, women voting as well as men. The chief industry is fishing. The Norwegians have always been great sailors Their merchant fleet is one of the largest in Europe. other industries are connected with timber from the forests which cover the mountains. The exports are timber, wood-pulp for paper-making, paper, fish, skins and hair, tar and tallow, silver, copper and nickel. The chief crops are oats and potatoes, grown in the south. The population is about 2½ million.

Christiania (258), the capital, on a fine harbour at the head of a long deep fiord, is the chief commercial town. **Bergen** (91) is the chief fishing port. **Trondhjem** (55), formerly the capital, is the third port in Norway.

Sweden. The Government is a limited monarchy under a King. The power of making laws and of taxing rests with the Diet or Parliament, elected by the people, women as well as men voting. The population is about 6,000,000. About half are engaged in farming and half in commerce and industries. Half the country is under forests, the products of which are the chief exports. The main crops are oats, rye, and barley, and after them potatoes and wheat. Swedish iron is very valuable, the mines being within the Arctic Circle. There are over 5000 sawmills worked by water-power. The exports are timber, wood-pulp, sawdust, tar, bark, paper, matches, iron, metal goods, butter, and cheese.

Stockholm (419), the capital, is a beautiful city built on islands and on the mainland. It has much commerce and many manufactures. **Gothenburg**, or Goteburg (202), is the chief seaport. **Karlskrona** (27) is a very strong fortress and the headquarters of the navy.

92. DENMARK AND ICELAND.

This little State includes Jutland—one of the few peninsulas of the world that point northwards—and two islands—Zealand and Funen—which lie in the broad channel between Denmark and Scandinavia.

The country is a part of the great plain of Northern Europe.

The climate is maritime, the average rainfall about 20 inches. The Danes are good farmers, and grow oats, barley, rye, hay, beetroot, and a little wheat and potatoes. They rear cows and p poultry. They export great quantities of butter, bacon, and millions of eggs, chiefly to England.

Denmark is ruled by a King. Legislation and the power of taxation rests with the Rigsdag or Parliament elected by the people. The population is 3,290,000.

Copenhagen (666), the capital, is the only large town. It has a good harbour and is the port of the country.

ICELAND, a large island in the Atlantic, far north of the British Isles, is now (since 1918) a free and sovereign state, with its own Parliament under its own King, who is also the King of Denmark. It is a "land of snow and fire." It has a high volcanic mountain, **Hecla**, and many "geysers" or hot springs (see Fig. 40). The population is about 95,000. The people breed cattle and fish.

93. RUSSIA.

RUSSIA is the vast flat plain of Eastern or Continental Europe, extending from the Arctic Sea in the north to the Black Sea in the south. It has a coast-line on four seas, the White Sea, the Baltic, the Caspian, and the Black Sea. But all four are inland seas; they are either landlocked, or the straits leading out of them are too narrow and shallow to afford an easy passage to the ocean for large ships and steamers, and they are frozen for many months in the year. The result is that Russia has always been more or less cut off from peninsular Europe.

In the north, around the White Sea, there is the wide stretch of tundra land, marshy and mossy, the home of the reindeer, the Polar bear, and the Arctic fox. To the south lies the broad expanse of coniferous forest, covering thousands of square miles. In the clearings grow hardy grains, such as oats and rye. The industries of the scattered villagers are the collection of the products of the soft-wooded conifers—bark.

wood-pulp, turpentine, tar, pitch—and the skins and furs of the bears, the foxes, the weasels, and the sables which live in the forest. These products are exported from Archangel.

To the south of the conifers lies the broad belt of deciduous forest, oak, maple, ash, lime, and beech trees, stretching from the Carpathians to the Ural Mountains, across Central Russia. Here there are many more and wider clearings, where the trees have been cut down, and, in the fields thus made, flax and hemp are cultivated with rye, oats, and barley. Logs of hard wood are sawn into planks. There are over 2000 sawmills in the country.

Southern Russia, where the air is too dry for trees, is a wide expanse of steppes or grass-land. The soil of the western steppes is rich "black earth," which, like the "black cotton soil" of India, is very fertile. Enormous crops of wheat and hay are raised. Rye, tobacco, barley, beetroot, maize, and potatoes are also largely grown. In this region are found the largest population and some of the largest cities. The great ports are Odessa on the Black Sea and Astrakhan on the Caspian. To the south-east of the rich steppe-land, all long the north of the Caspian Sea, lie the poor steppes, vast stretches of barren land. Tribes of wandering Tartars, with their horses and camels, are the only inhabitants of these treeless plains.

The north-west of Russia—FINLAND, now an independent state, having its own government—is a land of lakes, lagoons, and marshes. There are in this region more than 5000 lakes, most of them running into one another. **Ladoga**, the largest lake in Europe, overflows by the little river Neva, 43 miles long, into the Gulf of Finland. **Lake Onega**, 700 feet deep, is connected with the White Sea by a chain of rivers and lakes.

The **Caucasus** is a mighty range of snow-clad mountains running east and west for 750 miles from the Black Sea to the Caspian. The highest peak, Elburz (18,500 feet), is an extinct volcano. "They bar the way against any warm breezes from the tropics."

The great plain of Russia rises very gently in the centre to the low plateau of the **Valdai** Hills, 800 to 1000 feet above the sea, but the slope is so long and so gentle that it can hardly be seen, being a rise of about one foot in the mile. Most of the great rivers of Russia rise on this plateau and either flow north, *e.g.* the Dwina; south, *e.g.* the Volga, Dnieper, and the Don; or west, *e.g.* the Duna. Outside this system of rivers are the Pechora and the Ural, which rise in the Ural Mountains, and the Vistula and Dniester, which rise in the Carpathians. Owing to the gentle slope of the land, all these rivers flow very slowly, and are navigable almost from their source to the sea. Most of them have cut their beds deep into the land and now flow along the bottom of ravines, so that their banks are like steep cliffs. Most of them are united by canals. From very early times these rivers and canals have been the great waterways of Russia. In summer rafts and boats and small steamers use them. In winter they are frozen, and sledges drawn by horses move rapidly over the smooth frozen surface.

The **Volga** (2200 miles), called Mother Volga by the Russians, is the largest and the longest river in Europe, longer than Mother Ganga of India. On the left bank one great tributary, the **Kama** (1170 miles), brings down the rainfall from the Urals, in which it rises. On the right another great tributary, the **Oka**, waters the most fertile part of Russia. It is a mile wide when it joins the main river. At the mouth of the Volga is the port of **Astrakhan.**

The **Dnieper** (1330 miles), called Father Dnieper by the Russians, flows through banks 300 feet high into the Black Sea. At its mouth stands **Odessa.** The **Don** (1153) is a very broad river, being 18 miles across when in flood, when it brings down so much mud and silt into the little Sea of Azof as to make it shallow and difficult for navigation. With its tributary the Donetz it drains one of the great coal-fields of Central Russia. The famous Cossack horsemen of Russia come from this region.

The **Duna**, or Western Dwina, and the **Niemen** drain western Russia and flow westward through marshy country into the Baltic. The **Vistula** is the great river of Poland, the most westerly province of Russia, and flows through Germany into the Baltic. The **Northern Dwina** (1100 miles) and the **Pechora**

(980 miles) drain northern Russia and flow northwards into the White Sea and the Arctic Ocean.

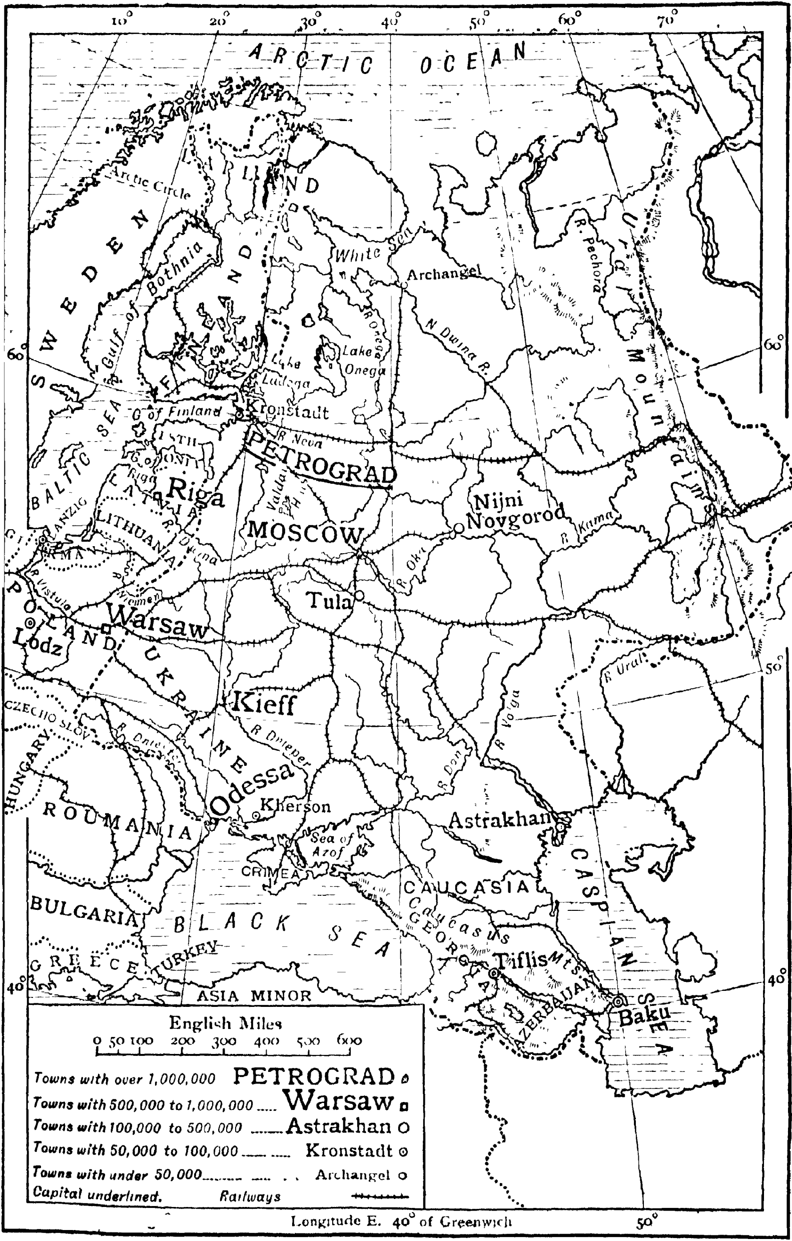
The climate of Russia is one of great extremes. In winter the temperature is below freezing-point, and, except in the far south, land and water, rivers and lakes are covered with ice and snow. There is no range of mountains running east and west across the country to shield it from the icy blasts from the Arctic regions, which blow across the Russian plains right down to the Black Sea in the far south, in winter. Over the low Ural Mountains and through the wide Ural-Caspian gap blow the keen cold winds from the great Siberian plains. The climate gets colder as we go from west to east, more and more into the heart of Eurasia, and is much colder than it is in the same latitudes in western or peninsular Europe. The air is very dry as well as cold, for the open ocean is far distant from Central Russia. The rainfall is seldom over 20 inches, and in many places not more than 6 inches. The summers in Russia are short and hot, while the winters are long and cold.

The products of Russia are chiefly agricultural. The chief grains are oats, rye, wheat, and barley. Flax and hemp are largely grown in the north. Russia produces two-thirds of the oats and one-half of the rye of Europe, and nearly four-fifths of the world's flax. Besides these, potatoes, maize, barley, hay, tobacco are grown and exported. Other exports are timber, furs and leather, eggs, butter, and metals.

In *minerals* Russia is very rich. There is much coal and iron, but the mines have not yet been largely worked. The Ural Mountains are rich in platinum and gold; over nine-tenths of the world's platinum comes from here. There are three great coal-fields around Moscow, Warsaw, and Lodz (Poland). The *manufactures* are spirits (vodka made from barley), cotton, sugar, flour, woollen goods, linen, cigars, and cigarettes. and leather. There are now large iron-works in Tula.

Government. - Russia is now in name a Republic, but the whole country is (in 1922) in a state of anarchy. In 1917 there was a revolution of the labouring classes, who murdered their Czar and numbers of the nobles. Since then there has

RUSSIA



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The following States have governments of their own and are no longer dependent on Russia:— Finland (cap. Helsingfors), Latvia (cap. Riga), Lithuania (cap. Vilna), Poland (cap. Warsaw).

been disorder, famine, and disease everywhere. A number of independent Republics have arisen, each with its own government. They are—on the Baltic coast, (1) **Finland** (3400), chief town **Helsingfors** ; (2) **Poland** (see *Central Europe*, pp. 448); (3) **Esthonia** (1750), capital **Reval**; (4) **Latvia** (1503), capital **Riga**; (5) **Lithuania** (4800), capital **Vilna**: on the Black Sea coast, (6) **Ukraine** (26,000), capital **Kieff**: between the Caspian and Black Seas, (7) **Georgia** (3053), capital **Tiflis** (346); (8) **Azerbaijan** (2096), capital **Baku** (250).

The population of Russia is about 131 millions.

Petrograd (1915) was built about 200 years ago by Peter the Great, and made the capital instead of Moscow, the ancient capital. It is on the Neva, and is a handsome city with great trade and large exports, chiefly of butter and oats. **Kronstadt** is a strong fortress on an island which commands the approach to Petrograd. **Riga**, capital of **Latvia** (185), is the largest export town in Russia, being the outlet for the produce of the basins of the Dwina, the Dnieper, and the Volga. It exports eggs alone to the value of twelve crores of rupees, also timber, flax, hemp, grain, and skins. **Moscow** (1050) is on the Moskva, a tributary of the Volga, in the centre of Russia. It is the capital of the Republic and a great nodal town (see Map). **Odessa** (631) is the great port on the Black Sea, with enormous exports of wheat. **Kiev** (626), on the Dnieper in Ukraine, is the holy town of Russia, from its splendid churches. It has great flour mills, being in the black-earth region. **Tula** (140), the " Birmingham of Russia," is in the centre of a great coal and iron district, and has large manufactures of arms, cutlery, and machinery. **Astrakhan** (162) is the great port, at the mouth of the Volga, on the Caspian. **Nijni Novgorod** (112), on the confluence of the Oka and the Volga. Here there is a great annual fair, to which merchants come from all parts of Russia. **Archangel** (43) is an important port on the White Sea, being the only outlet to the open ocean in Russia. It is at the mouth of the Dwina. Its harbour is, however, frozen for half the year. It has large exports of timber and tar.

94. THE BALKAN STATES.

THE Balkan is the most easterly of the three peninsulas of southern Europe. It is a rugged and mountainous plateau, on which rise many ranges of mountains, the chief being the **Dinaric Alps** (called the **Pindus** Mountains, in the far south in Greece), running from north to south along the western coast with an average height of 8000 feet, and the **Balkan Mountains**, which stretch across the country from west to east, the highest point being Mt. Olympus (9800 feet). The peninsular rivers are all short and rapid. The lower course of the Danube, however, is for 500 miles through the northern state, Roumania. It is an "international highway," open to the vessels of all nations.

There are six Balkan states, each with its own Government. They are Roumania, Jugo-Slavia, Bulgaria, Albania, Turkey, and Greece.

ROUMANIA.

Roumania (or Rumania) is the most northerly and largest of the Balkan States. It belongs to the black-earth region, and yields enormous quantities of wheat and maize for export, with barley and oats; also petroleum, beans, and oil-seeds.

The Government is a monarchy, under a King and Parliament, with two houses—a Senate and a Chamber of Deputies. The population (1922) is 17,400,000.

Bukharest (346), the capital, is a fine town with large trade.

BULGARIA.

This, the second in size of the Balkan States, is situated north and south of the main Balkan range. It has a coastline on the Black Sea. North of the Balkans, in the basin of the Danube, the climate is extreme and dry, and wheat and maize are extensively cultivated. To the south of the Balkans there is a warm fertile plain called Rumelia, and known as the "land of roses," which are very largely grown, and here "attar of roses" is made. The little river Maritza waters the plain, and, besides roses, tobacco, cotton, the vine, the mulberry, and many fruit trees are cultivated.

The Government is a monarchy under a King and National Assembly of one chamber, called the Sobranjee, elected by the people. The population is about 5 million. The exports are wheat, attar of roses, maize, silk, cocoons, hides, and skins—also fruit and tobacco. **Sofia** (154) is the chief town.

JUGO-SLAVIA (land of the South Slavs) includes the former kingdom of Servia, Montenegro, and certain parts of old Austria-Hungary, all joined together after the war, and called by themselves the **Serb, Croat,** and **Slovene** state. It is the most fertile and thickly peopled of the Balkan States, is a hilly country, well wooded and watered by the Save and Morava. The exports are prunes, wheat, maize, meat, swine, and fowls.

The Government is a monarchy under a King and a National Assembly, the Skupshtina. The population is about 11 million.

Belgrade (120), the capital, is on the confluence of the Save and the Danube.

ALBANIA.

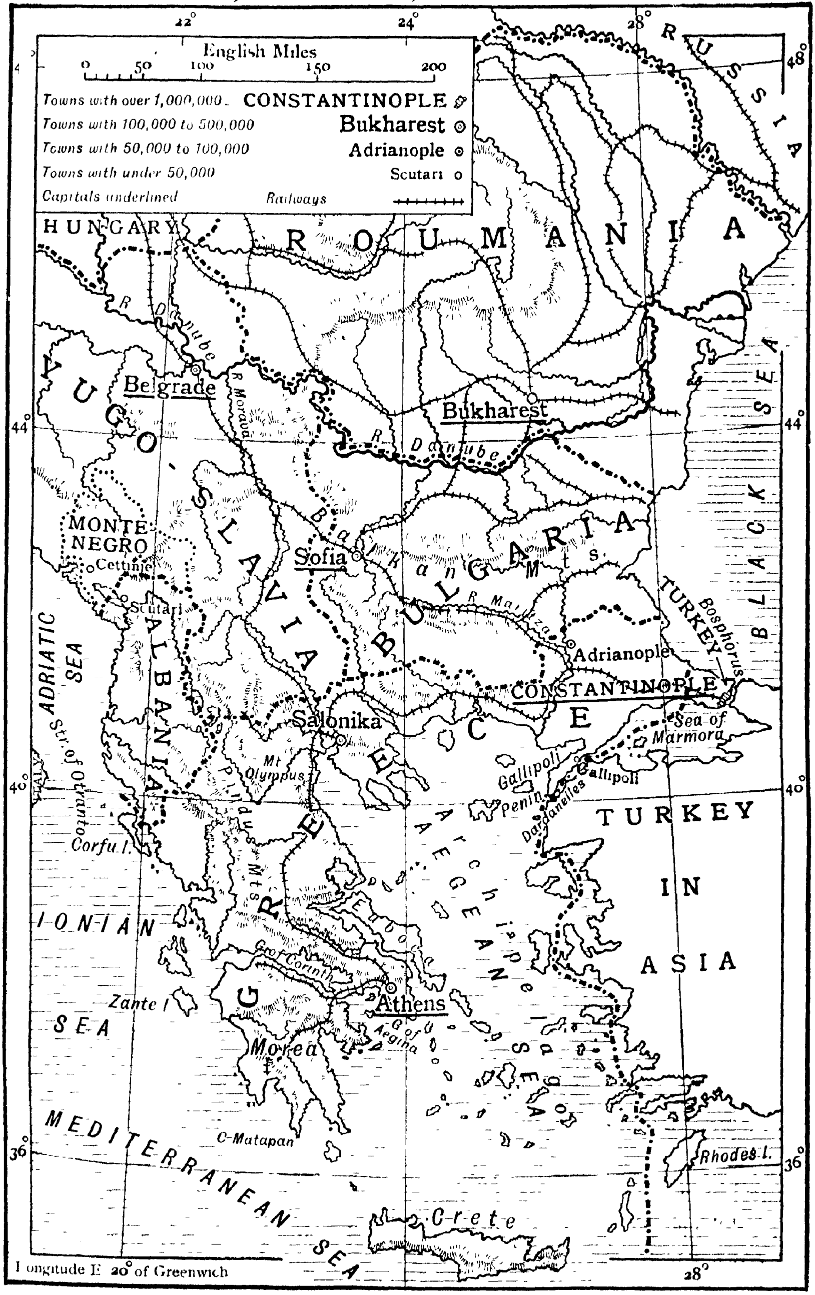
is another Free State on the Dinaric Alps, with a population of about (1400). Most of the inhabitants are Muhammadans. **Scutari** (32), on the Adriatic, is the largest town.

TURKEY.

Turkey (in Europe) is the oldest of the Balkan States and formerly ruled the whole peninsula. But one state after another rebelled and made itself independent. Turkey in Europe is now a small country north of the Sea of Marmora, with a population of about 1¼ million, about half of whom are Muhammadans. The soil is fertile, but the peasants are ignorant and poor. The chief products are tobacco, grain, figs, almonds, and fruits.

The Government is (1924) a Republic under a President elected by a Grand National Assembly which sits in **Angora,** now the capital of Turkey.

TURKEY, GREECE, BALKAN STATES



Constantinople (1000) is a strongly fortified town on the Bosphorus and commands the entrance to the Black Sea from the Sea of Marmora. It was once the capital of Turkey, and is a handsome city full of mosques. **Adrianople** (83), on the Maritza, is strongly fortified and used to have much trade and many manufactures. **Gallipoli**, on the Dardanelles, is the chief naval station.

GREECE.

Greece, the southernmost state, is a peninsula covered with hills and fertile valleys between them. It is a beautiful country with a very pleasant climate, warm and sunny. Deep gulfs run far into the land, and the Ægean Sea close to the coast is covered with islands. The Greeks are a nation of sailors and are keen traders. They go all over the Mediterranean Sea.

In the warm lowland valleys grow olives, grapes, tobacco, and fruit of every kind. The small dried grapes called currants come from the hills near Corinth in Greece. In the sea sponges are found and exported.

The population is about 5½ million. The Government is a monarchy under a King with a Parliament and a Council of State.

Athens (300), the capital, is a handsome city on the Gulf of Ægina. It was a very famous city over 2000 years ago. **Salonika** (170), at the head of the gulf of the same name, is an important port.

95. AMERICA.

AMERICA extends farther to the north and farther to the south than any other continent (see Map 1). From far beyond the Arctic Circle it runs down for nearly 10,000 miles to within a few degrees of the Antarctic Circle, between the Atlantic Ocean on the east and the Pacific Ocean on the west. It is divided, near the Equator, into a northern and a southern half by the Isthmus of Panama, about 31 miles across in the narrowest part.

The southern end of North America is usually called **Central America**. In this book it is described separately.

The two Americas resemble each other in several ways. Each of them is, roughly speaking, a huge triangle, wide in the north and narrowing down, almost to a point, at its southern end. Both of them have long chains of lofty mountains, chiefly volcanic, on their western borders, and on their eastern borders very old folded mountains, much weathered and worn down into plateaus. In both continents there is a vast lowland basin, once a shallow ocean, between the lofty mountains on the west and the lower mountains on the east, and these basins have been filled up, in the course of ages, by alluvial soil washed down into them from the highlands on either side. To the north-east of each lies an archipelago of islands. In both continents, too, great mountain ranges running north and south shut out the moist winds from the oceans on the east and west, particularly on the west, leaving the interior lands dry; while in neither continent does any range run across from east to west, so as to shut out winds blowing from the north or from the south.

On the other hand, there are many points in which the continents are not merely unlike but are a contrast, the one to the other. These points are chiefly due to the fact that the greatest width of each is in very different latitudes. All the northern part of *North America* is within the Arctic Circle, and the wide stretch of land immediately to the south, situated within the north Temperate zone, lies open to the icy blasts from the frozen ocean on the north, for no mountain range runs across to keep them out. Freezing ocean currents, too, bathe the eastern coasts (Lesson 56). The consequence is that there are great areas so cold as to be uninhabitable by man. Much of it is swampy tundra, where few animals can live. But the widest part of *South America* lies in the Tropics, right under the Equator. Warm moist winds blow over it from the "caldrons" of the Gulf of Mexico and the Caribbean Sea. Warm ocean currents lave the north-eastern coast. As a consequence, the vast plains watered by the Orinoco and the Amazon are covered with the densest forests in the world, filled with animal life. There is a similar contrast between the tropical or extreme southern part of North America, with its hot steamy plains and great Dismal Swamp, and the cold and mountainous southern end of South America. There are no great lakes in the southern continent like those in the northern, which are the largest in the world. And the deep bays and gulfs and peninsulas, and long coast-line of North America, resembling those of Europe, have nothing corresponding to them in the unbroken coast of South America, which is very much like that of Africa in this respect.

THE GREAT LAKES.

A careful look at the physical map of North America (No. 11) will show that a chain of great lakes stretches in a north-westerly direction from Lake Ontario to the Great Bear Lake. There are at least ten large lakes and hundreds of smaller ones not shown on the map. They are of great value as water-ways. Thus steamers can pass from Lake Superior, in the heart of North America, down to the Atlantic Ocean, carrying enormous loads of wheat from the fertile fields that lie around the lakes.

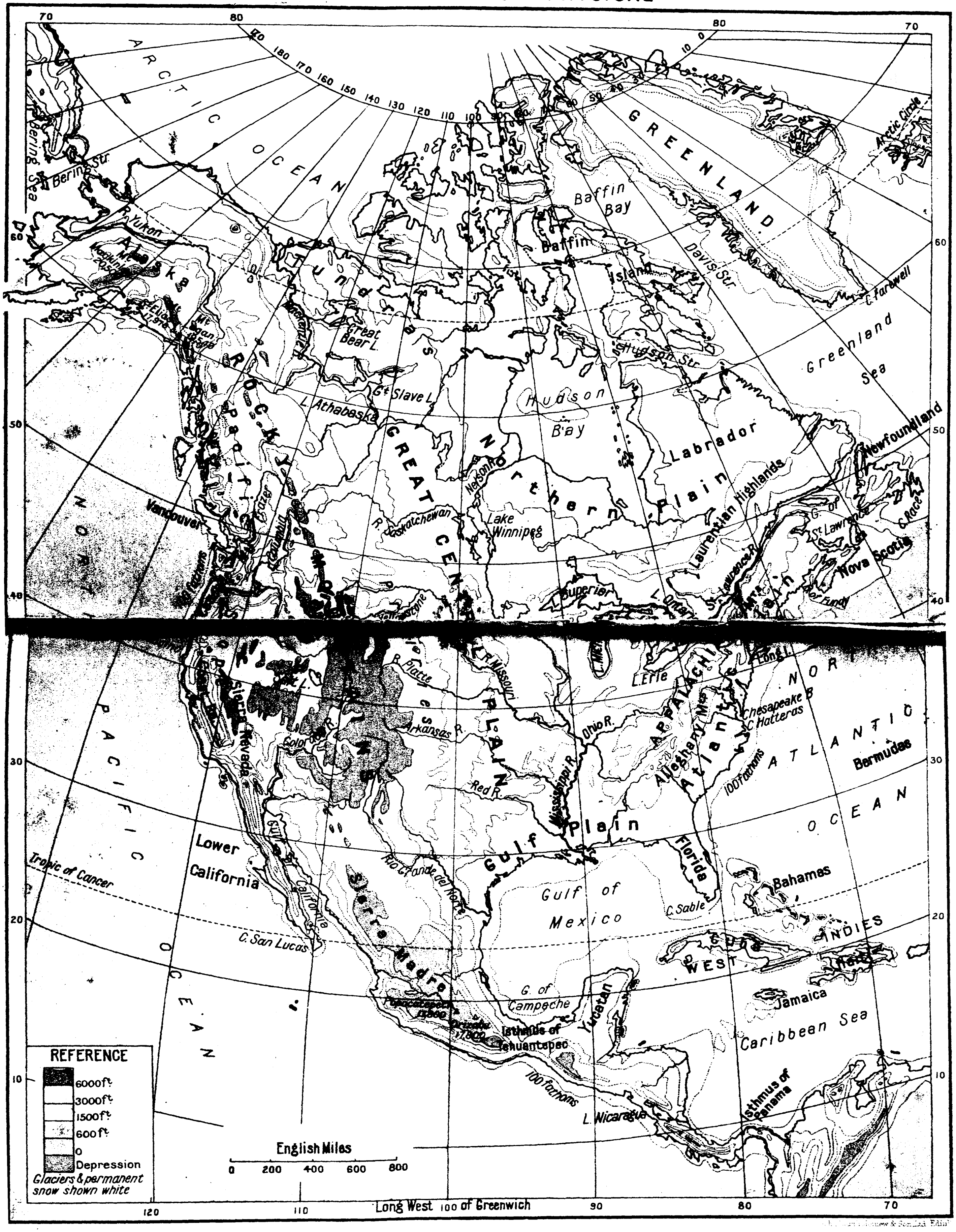
Moreover these lakes are not on the same level. The levels sink from west to east. Lake Superior lies at a level of 602 feet above the sea, Lake Michigan at 580 feet, Lake Huron at 580, Lake Erie at 573, Lake Ontario at 246 feet. Between the two last the water from the higher lakes falls in a vast sheet by one drop of 158 feet over the cliff or waterfall of **Niagara.** This rush of water gives enormous *water-power*, by which large cities are lighted and machines and engines are worked.

NORTH AMERICA.

This continent includes (1) a broad belt of lofty mountains on the western side; (2) a narrower belt of lower mountains and plateaus on the eastern side; (3) a wide area of lowlands, including plains and low plateaus, lying between them; (4) a wide coastal plain on the east and south.

Atlantic Coast.—Along the eastern or Atlantic coast [illegible] deep bays and gulfs run far into the land (see Map 11) [illegible] largest being *Hudson's Bay*, the *Gulf of St. Lawrence*, and the *Gulf of Mexico.* There are three large peninsulas: *Labrador*

NORTH AMERICA—PHYSICAL



in the north and *Yucatan* in the south stretching northwards (nearly all peninsulas stretch southwards), and Florida running southwards. This coast lies opposite to Europe, and the numerous excellent harbours it contains assist commerce greatly. Nearly all the towns and cities on the coast have grown up on these harbours. The first colonists in North America came to the east coast and settled there.

Pacific Coast.—The Western or Pacific Coast has two peninsulas. *Alaska*, a huge broad plateau, stretches northward towards Asia, between the Arctic and the Atlantic. *California*, long and narrow, runs southwards. Between it and the mainland lies the only large gulf on this coast, the Gulf of California To the south of Alaska there are hundreds of deep fiords, like those of Norway, fringed by a long line of countless hilly islands, mostly very small They make a natural breakwater of great value, for inside it ships go up and down the coast, unhurt by the great waves of the Pacific Ocean

The wide coastal plain along the eastern coast is called the Atlantic Plain. It broadens out in the south, where it takes in the whole of the low lying peninsula of Florida, and is called the Gulf Plain along the Gulf of Mexico, and includes the Flood Plain of the lower Mississippi River

The shallow sea over the great banks in the Atlantic opposite to Newfoundland is filled with countless swarms of fish (like the Dogger Banks in the North Sea) It is a very valuable fishing-ground.

THE MOUNTAIN SYSTEMS AND COASTAL PLAINS.

The **Atlantic Ranges** all belong to the Appalachian mountain system. The main range of the *Appalachians* runs through the eastern United States, where it is known by various names in different parts. The highest peak, Mt Washington, is 6290 feet high. In the far north, in Labrador, the system is known as the *Laurentian Highlands*, rising above the river and Gulf of St. Lawrence. Here there are peaks 8000 feet in height. The middle part of the system is called the *Alleghany Mountains*.

Under it lie the "great stores of coal on which the manufacturing industries of the eastern states largely depend."

The **Western or Pacific Ranges** extend along the whole length of the western side of the continent and widen out, in the middle, to about 1000 miles. In this "sea of mountains" at least four ranges may be traced, although the term Rocky Mountains is sometimes applied to the whole system.

(1) The **Rocky Mountains** or "Rockies" are the most easterly of these ranges. They overlook the great central plains, from which they look like high walls of rock, whence their name. Many peaks rise to 14,000 feet.

Along the west of the Rockies lies a high mountain valley about 800 miles long, in which rise the Frazer, the Columbia, and other rivers. To the west the land rises again from this long valley into another great mountain system, viz.:

(2) The **Western Cordillera**, which runs along the whole length of the Pacific coast and includes (1) the *Cascade Mountains*, a line of extinct volcanoes (some of them 14,500 feet high), down the slopes of which many streams of water fall in cascades ; (2) the *Selkirks*, which rise like an island between the Frazer and Columbia rivers ; and (3) the *Sierra Nevada*, which runs for 500 miles along the eastern side of the great valley of California, with many snowy peaks 14,500 feet in height.

(3) The **Coast Ranges** are west of the main Cordillera chain. They rise steeply from the Pacific coast to a height of 7000 to 8000 feet. These mountains are densely wooded, for on them falls the heavy rain (over 100 inches) brought up by the westerly winds from the Atlantic. They get higher and higher as they go northward. In Alaska they reach their greatest elevation in the famous peaks of Mt. St. Elias, Mt. Logan, and *Mt. McKinley*, 20,500 feet above sea-level, the highest mountain in North America.

(4) **The Island Mountains.**—There is still another long range of mountains rising from the narrow continental shelf, below the surface of the sea, along the Pacific Coast. Only their summits and higher slopes can be seen in the shape of long rocky islands, of which the largest is **Vancouver**. The

map shows a long fringe of these island mountain-tops on the coast from Vancouver to Alaska.

THE GREAT SALT LAKE BASIN

lies between the Sierra Nevada and the Rockies. It sinks to a hollow about 500 feet below sea-level, known as the *Valley of Death*, a dry and thirsty land, with a rainfall of less than five inches in the year, in which only stunted bushes grow. This basin was once an inland sea. There are still many salt lakes in it, the best known being the Great Salt Lake in Utah State. Here the thrift and industry of a strange sect of Christians known as the *Mormons*, who settled in the country, "have transformed their desert home into productive farms." Their settlement is called Salt Lake City. Parts of the basin are famous for rich mines of gold and silver.

THE GREAT CENTRAL PLAINS

between the eastern and the western mountains extend from the Arctic Ocean on the north to the Gulf of Mexico on the south; the "*Divide*," or watershed, between these two seas being only 800 feet above sea-level. This long ridge, roughly speaking, divides Canada from the United States. To the north flow the Nelson, the Mackenzie, the St. Lawrence, and other Canadian rivers. To the south flow the great rivers of the United States—the Missouri, the Mississippi and its tributaries.

The Plains include the *Prairies*, which stretch northward for 1400 miles from Mexico to the Great Lakes, measuring over half a million of square miles. These wide, open, treeless expanses of land were at first vast grazing-grounds. They are now covered with wide fields of wheat; for the limestone soil, left by the ocean which once covered this land, and the warm dry summer climate, suit wheat admirably. They are well watered by the Mississippi and its tributaries. On them great cities have arisen to meet the wants of the farmers, both as regards trade and manufactures, *e.g.* Chicago, St. Louis, and Cincinnati. They rise gently westward into the High Plains.

The **High Plains**, under the lee, *i.e.* on the eastern or rainless side of the Rocky Mountains, have a drier climate than the Prairies, and are not so fertile. They extend for 2000 miles northward from the Rio Grande del Norte, the river which divides the United States from Mexico, to the Mackenzie River in the far north of Canada. To the west they rise gently upwards to a height of about 6000 feet, and end at the foot of the Rockies. The slope is so gradual that great railway lines, *e.g.* the Canadian Pacific Railway, run easily over them to the passes in the Rockies. In the south these higher plains are more or less a desert, known as the "Bad Lands," but in the north, in Canada, they are used for grazing purposes.

THE GREAT RIVERS

may be divided into those which flow (1) northward, into the Arctic Ocean and Hudson Bay, viz. the Mackenzie and the Saskatchewan—Nelson; (2) eastward, viz. the St. Lawrence; (3) southward, viz. the Mississippi and the Grande del Norte; and (4) westward, viz. the Colorado, the Columbia, the Frazer, and the Yukon.

The **Mackenzie** (2000 miles) flows northward through the tundras into the Arctic Ocean, taking with it water from three great lakes—Athabasca, the Great Slave Lake, and the Great Bear Lake, which it drains.

The **Nelson** (1700 miles) flows from Lake Winnipeg northward into Hudson Bay. But into Lake Winnipeg flows the Saskatchewan from the Rocky Mountains. The two rivers together are often called the Nelson-Saskatchewan.

The **St. Lawrence** (2200) is by far the most important river of Canada, for it flows through the Great Lakes. It waters the two great Canadian provinces of Ontario and Quebec. It flows eastward into the Gulf of St. Lawrence. Besides the ocean commerce, it carries "the wheat of the north-west, the mineral ores of the uplands, and the lumber from the forests to the populous states in the east."

The **Mississippi** (2500), the "Father of Waters," the great river of the United States, rises in the plateau of the Great Lakes and flows southward through the Great Plains into the Gulf of Mexico. If its length be reckoned from the source of the Missouri, its largest tributary, which rises in the Rocky Mountains and is 3000 miles long when it joins the main river, it is over 4000 miles long, and this makes it the longest river in the world. Besides the Missouri, it has many other tributaries, each a great river in itself: on the left bank the *Ohio*, and on the right the *Yellowstone*, the *Platte*, the *Arkansas*, and the *Red River*.

The **Rio Grande del Norte** (1800 miles), which is, for most of its course, the boundary between the United States and Mexico, rises in the Rocky Mountains and flows southward into the Gulf of Mexico.

The **Colorado** (2000 miles) rises in the Rockies and flows westward across great plateaus, through which it has cut out for itself deep *canyons* or gorges in the lava rock, 5000 feet deep.

The **Columbia** (1400 miles) rises on the western slope of the Rocky Mountains, and with its tributaries has cut deep canyons in the beds of lava through which it flows. The canyon of the Snake River, which joins the Columbia, is 1000 feet deep.

The **Frazer** (750), which also rises on the western slope of the Rockies, is the most important river on the Pacific coast. It waters British Columbia and Vancouver provinces.

The **Yukon** (2000 miles), the great river of the north, flows through Alaska into the Bering Sea.

CLIMATE.

The factors of climate described in Lesson 57 of this book divide North America, in a general way, into the climatic regions given in Lesson 58. There are the maritime regions on the Atlantic and Pacific coasts, where the temperature is more equable than it is in the interior lowlands where the climate is extreme. But the north-west coast is warmed by the winds off the warm Pacific current, while the north-east coast is chilled by the winds blowing over the Arctic (Labrador) current. And the climate is much colder in winter and much warmer in summer than it would be if there were mountain ranges running east and west to keep off the cold Arctic northerly winds in winter and the warm tropical southerly winds in summer from the interior of the continent. The cold air on the lofty mountain ranges running north and south brings down the rain from the moist ocean winds which blow over the great central plains of the interior as dry winds, making the climate dry. Steppes and deserts occur in the great basins and dry regions on the western plateaus. In the extreme south, along the Gulf of Mexico, the air is hot and moist and the climate tropical.

PLANTS AND ANIMALS.

The zones of vegetation are those described in Lesson 59. There is the Arctic region in the far north, where the land is covered with eternal ice and snow, where the seal, the walrus, the polar bear, and the Arctic fox are found. To the south lie the tundras, the land of swamps, mosses and reindeer, here called the caribou. Then come coniferous forests of gigantic pine and fir trees, often 200 to 300 feet high, in what is often called the Sub-Arctic zone, which slants across the continent from Alaska in the north-west to Newfoundland in the south-east. Through these forests the moose deer roams, with the black bear and the puma. In the colder parts there are numbers of fur-bearing animals, such as the sable, the ermine, and foxes of many kinds. The next zone is that of the deciduous forests—with huge maples, elms, and beech trees—eastwards, where there is rainfall; and the treeless plains or prairies to the west. In the forests, particularly on the mountains, are found the puma, the grizzly bear, and the opossum. The prairies were once the home of the bison. The prairie wolf or coyote is still found in numbers wherever the land is uncultivated.

WILD ANIMALS.

The Bison (*Buffalo*).—This animal is very much like the Indian bison. It was found once in millions on the wide plains of North America, but such numbers were killed for their hides that very few are now left. The plains on which they used to feed are now covered by crops of grain. The bison has an enormous mass of thick hair covering its head and shoulders.

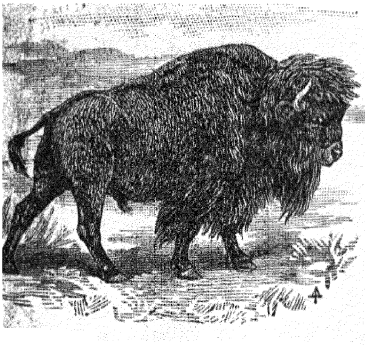


FIG. 194.—AMERICAN BISON.

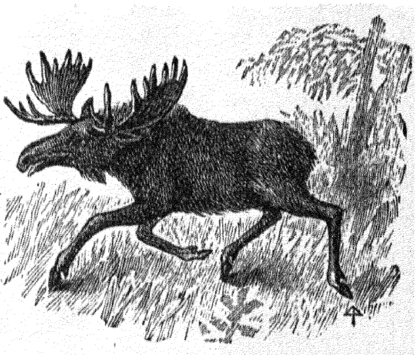


FIG. 195.—MOOSE DEER.

The *Moose Deer* or elk is something like the Indian sambhar. It is the biggest of all living deer, standing over six or seven feet at the shoulders, and weighing quite 1200 pounds. It has very large branching antlers. It is found in most forests where there is water, and can swim for miles. In summer it feeds on leaves and twigs in open wooded land, but in winter the herds retire into the thickest of the forests.

The *Prairie Wolf*, also called the coyote, is found all over North America. It is a good deal smaller than the common wolf, and has a coat covered with fur. It is a very handsome little animal, and has a different colour at different times of the year, being sometimes grey, sometimes brown, and sometimes nearly red. It lives on rabbits and prairie dogs, and prowls about farmyards and kills hens and chickens and sometimes dogs. In the forests are found the great grey wolf, the black wolf, the timber wolf, and other kinds as well.

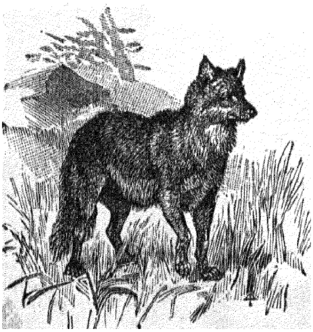


FIG. 196—PRAIRIE WOLF.

The American *Black Bear* is smaller than the grizzly, and has a more pointed head. It eats fish, insects, honey, and small animals when it can catch them. It has strong claws, and spends much of its time in trees, for it can climb well, looking for fruit, nuts, berries, and soft bark. It is found in all the forests.

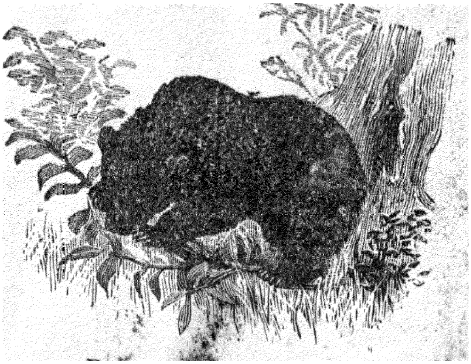


Fig. 197.—Black Bear.

The *Grizzly Bear* is the biggest and fiercest of the bear tribe. It is often 9 feet long and weighs 800 or 900 pounds. It kills and eats deer, but feeds on nuts and wild fruits as well. It climbs trees, like all bears. It is a native of the Rocky Mountains. It has a very short tail.

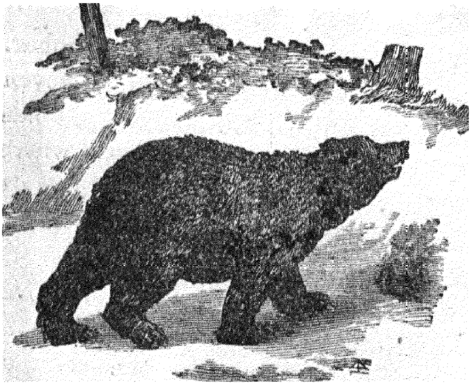


Fig. 198.—Grizzly Bear.

The *Puma* or "mountain lion" of America is a huge wild cat, about 7 feet long, found in all parts of the continent, north and south. It has no spots like the leopard. It spends the greater part of its time in trees, hunting for birds and monkeys. It also hunts deer, creeping up to them through the forest. It kills a great many sheep, pigs, horses, and cattle. It does not attack men, of whom it stands in great dread.

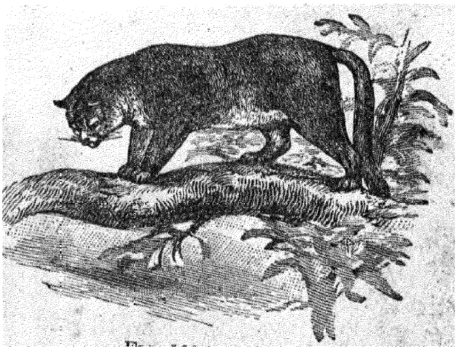
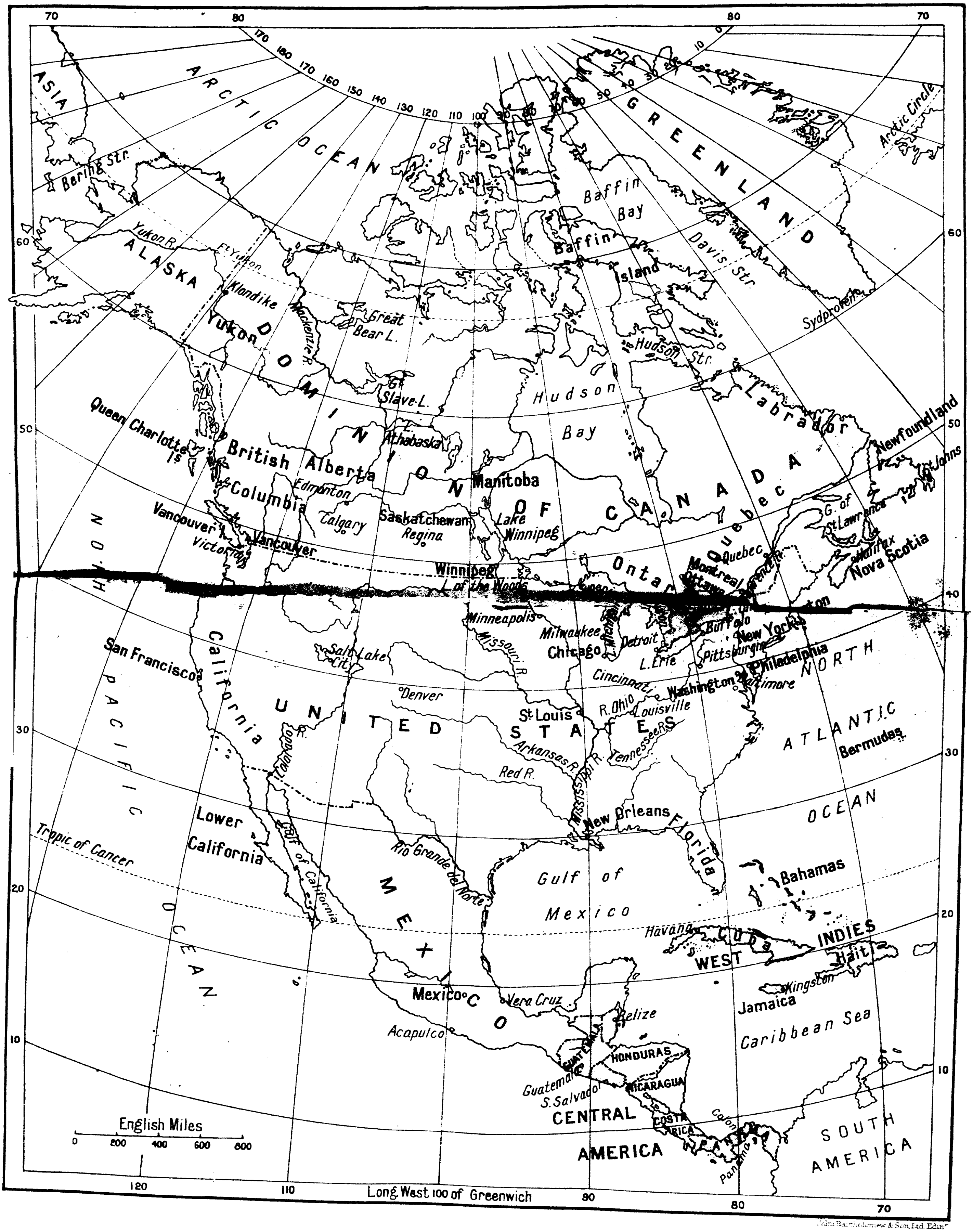


Fig. 199.—Puma.

NORTH AMERICA—POLITICAL



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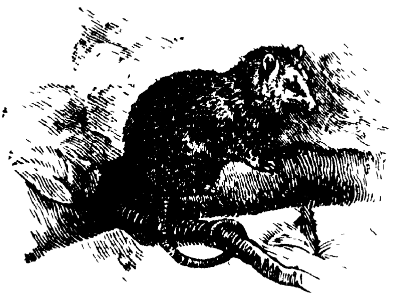


FIG. 200.—AMERICAN OPOSSUM.

The *Opossum* is a little animal that is something like a little monkey and something like a large rat. It lives in trees. It has a long tail, and can hang from a branch by it while it picks fruit or nuts off the twigs. It also kills birds and squirrels and rabbits. It sometimes goes at night into farmyards to steal chickens and eggs. It is a mischievous animal.

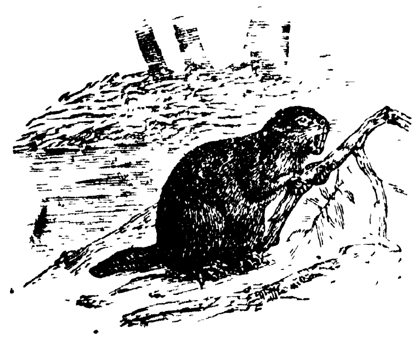


FIG. 201.—BEAVER.

The *Beaver* or water-squirrel is about two feet long, and is found not only everywhere in North America where there are woods and waters, but in northern Asia and in northern Europe as well. Its fur is much valued, and thousands of skins are collected by hunters and trappers every year. It spends most of its time in the water, and is a clever little engineer, for it builds dams across little streams to prevent the water running away. This it does with logs of trees which it cuts off with its sharp [illegible]. Beavers have been known to build a dam 200 yards long, 20 feet wide, and 8 feet high. They also build houses for themselves and families with logs under the water.

96. CANADA.

THE Dominion of Canada (see Map 12) includes all the northern half of North America, except (1) Alaska, which belongs to the United States; (2) Greenland, which belongs to Denmark; and (3) Newfoundland, with its dependency the Atlantic coast of

Labrador, which, although it is British territory, is not included in the Dominion, but is a colony with its own government. Canada is larger than the United States and twice the size of India. Its hills and its mountains, its valleys and plains, its lakes and its rivers, have been already described.

The chief *Exports* in order of value are wheat, timber, wood manufactures, flour, cheese, gold, silver, bacon, cattle, leather, iron, oats, copper, hides, and fish (tinned). *Railways* run all over central and southern Canada. The **Canadian Pacific** runs from Montreal on the Atlantic to Vancouver on the Pacific, a length of about 3000 miles. It crosses the Rockies by the Kicking Horse Pass at the height of 5300 feet. It has also about 14,000 miles of branch lines to all the large cities. The **Grand Trunk Pacific** runs across the Dominion by another route for 3600 miles, crossing the Rockies at the Yellowhead Pass (3700 feet). Altogether there are 31,000 miles of rail. The *Minerals* (in order of value) are coal, silver, gold, nickel, and copper.

The Dominion has nine provinces, and a large territory in the north. The Governor-General, who is the Viceroy of the King, is at the head of the Executive. There is a Federal or Imperial Parliament with a Senate or Upper House, and a House of Commons, elected by the citizens. The Parliament meets in **Ottawa** (in Ontario), the capital of the Dominion. Each province is under a Lieutenant-Governor and has its own Parliament, which deals with provincial affairs. In some provinces women may vote. The population is about 9 million.

The nine provinces are Nova Scotia, New Brunswick, Prince Edward Island, Quebec, Ontario, Manitoba, Saskatchewan, British Columbia, and Alberta.

NOVA SCOTIA.

Nova Scotia is a long narrow peninsula in the south-east of Canada. The coast is bold and rocky with many deep bays, which make good harbours. The **Bay of Fundy** has the highest known tides in the world, the spring tides rising 50 feet. The climate is maritime and remarkably temperate and healthy. The population is about half a million. The people are good sailors, and fishing is an important industry. Farming and fruit-growing employ most of the population. There are very rich coal, iron, and gold mines, the gold being the purest in the world. There are splendid forests. **Halifax** (70) has a magnificent harbour, the nearest to Europe on the continent, free from ice all the year round. It is strongly fortified, and is an important coaling station for the British Fleet.

PRINCE EDWARD ISLAND.

This, the smallest of the Canadian provinces, is an island lying in the Gulf of St. Lawrence. The population is about 88,000 It is the most thickly populated province, for its size, in the Dominion The soil is very fertile. Next to farming, fishing is the chief industry.

NEW BRUNSWICK.

This maritime province, facing the Gulf of St. Lawrence and the Bay of Fundy, has many good harbours. The population is about 390,000. The chief industries are lumbering and fishing. Iron, coal, and copper abound. Much grain is grown, and there are many manufactures. **St. John** (46½) is the largest town.

QUEBEC

is by far the largest of the provinces, and has a population of 2¼ millions. The climate is cold in winter and warm in summer. The rainfall is 36 inches. All the grains of temperate climates grow to perfection, and fruits of many kinds. Cheese and butter are largely made. The timber industry is very important, for there are great forests of pine trees. Fishing is important on the coast. The colony was founded by the French in 1608, and nine-tenths of the people are French and speak their own language. **Montreal** (607) is the chief seaport, and is the main terminus of the Canadian Pacific Railway. **Quebec** (79), the capital, one of the oldest cities in America, is built on a cliff on the banks of the St. Lawrence, and has a magnificent harbour. Nearly the whole of the world's supply of *asbestos* comes from Quebec.

ONTARIO.

This province, the second in size, has the largest population (3 millions). It lies along the northern side of the Great Lakes, on which it has a coast-line of 1700 miles. The climate is dry, bracing, and very healthy. The steamer traffic is enormous, being larger on the "Soo" Canal (between Lakes Huron and Superior) than that on the Suez Canal. In this province are found the finest pine forests in Canada. Farming is the most important industry, the growing of grain and fruit, stock-raising, and dairying. Lumbering comes next. There are valuable mines of gold, silver, copper, iron, and petroleum. Two-thirds of the world's supply of *nickel* comes from Ontario.

Toronto (377) is the capital of the province and the largest commercial town. It is built on Lake Ontario, has an excellent harbour, a fine university, and large manufactures. **Ottawa** (107) is the capital of the Dominion. Here the Federal Parliament sits. It has the largest trade in lumber in Canada.

MANITOBA.

This province, with a population of about half a million, was formerly known as the Settlement of the Red River, which waters it. In past ages it was the bottom of a great lake, which left thick beds of clay and silt over the land. This fertile soil makes Manitoba a rich wheat-growing tract, now largely covered with farms. The climate is very cold, but bracing and healthy. It is a land of lakes and rivers and open grassy prairies. In the north there are large forests of pine trees. The chief crops are wheat, oats, barley, potatoes, and flax. The farmers raise cattle and make butter and cheese. The lakes are full of fish. **Winnipeg**

(178), on the Red River, is the trade centre of the whole of north-western Canada and the largest grain market on the continent. Railways reach it from all directions.

SASKATCHEWAN.

The province is named after the river Saskatchewan, which flows through it into Lake Winnipeg. It much resembles Manitoba, and has the same products and about the same population. **Regina** (50), the capital, on the Canadian Pacific Railway, is the centre of trade.

ALBERTA.

Alberta has splendid land for the growing of grain and for the raising of cattle. The population is about 581,000. The settlers are farmers, who grow grain, make butter and cheese, and raise horses, cattle, pigs and sheep. There are great forests along the rivers and lakes. **Calgary** (63) is the capital, and the centre of the horse- and cattle-breeding industry.

BRITISH COLUMBIA.

This splendid province, with a population of half a million, has a coast-line of about 1000 miles along the Pacific coast and runs inland for about 450 miles. It includes a broad stretch of the Rockies, the coast ranges, and the Selkirks. It is a land of mountains, plateaus, and valleys, and has a narrow coastal plain as well. On the coast lies the great island of Vancouver. It has magnificent forests. It is watered by the Frazer, the Columbia, and many smaller streams. There are very rich mines of gold, silver, lead, and coal. Great numbers of fish are caught in the rivers and in the sea. "It is the most English of all the provinces, in the life of the people as well as in the climate." The servants are mostly Chinese who have come across the Pacific. The industries are lumbering, milling, fishing, and farming (grain and fruit). **Victoria** (39), the capital, is on a good harbour on Vancouver Island. Close by there is a great naval and coaling station for the North Pacific British Fleet. **Vancouver** (100), by far the largest town, is on a very good harbour, is the western terminus of the Canadian-Pacific Railway, and the point from which lines of steamers sail to Japan, Australia, and New Zealand.

YUKON AND THE NORTH-WESTERN TERRITORIES.

These are enormous tracts of land, very thinly peopled, mostly uninhabitable because of the cold. In Yukon there are valuable mines.

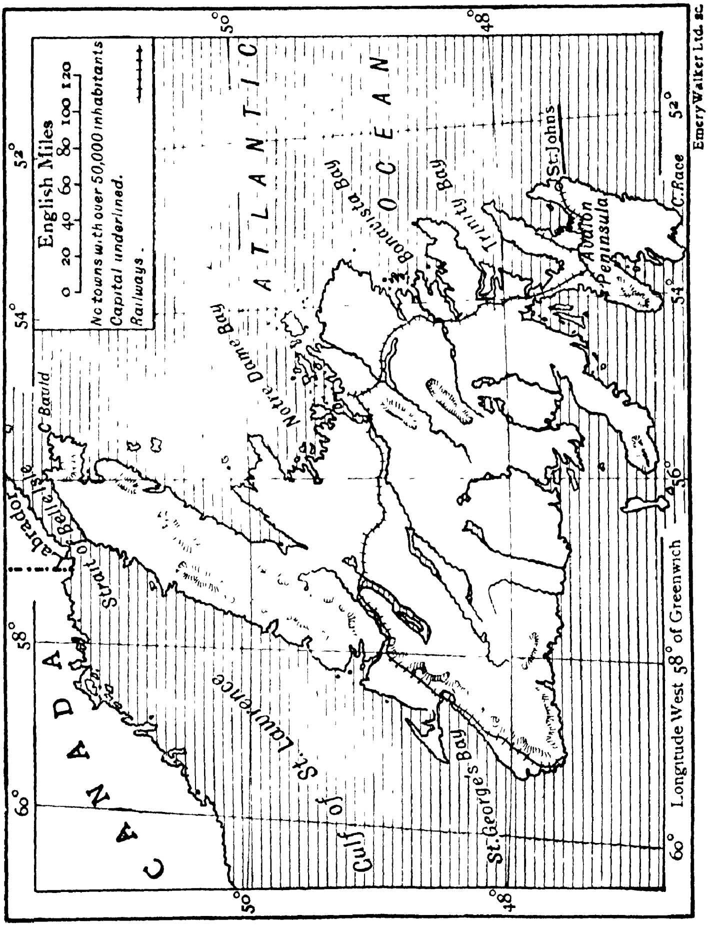
97. NEWFOUNDLAND.

THIS large island, nearly twice as large as Ceylon, has a population of about 250,000, nearly all fishermen. The island is not part of the Dominion, but forms a separate colony with the eastern coast of Labrador. It is one of the best fishing grounds in the world, for, close to it, in the Atlantic Ocean, lie the Great Banks, a plateau below the surface of the sea about 600 miles long and 200 miles wide, over which the water is from 150 to 600 feet deep. It has been formed by the rocks, stones, and mud which, for thousands and thousands of years have been dropped here by the countless icebergs brought down from cold Arctic lands by the Labrador current. The ice is melted by the warm waters of the Gulf Stream which here meets the icy current from the polar regions, and the rocks in the bergs drop to the bottom. But the cold air condenses the water-vapour over the Gulf Stream, and dense fogs are formed which make navigation very dangerous. The chief exports of Newfoundland are fish, paper, and wood-pulp for making paper, and iron ore. The capital is **St. Johns** (34) with a good harbour.

98. THE UNITED STATES.

THE United States stretch across the centre of North America for about 2500 miles from the Atlantic to the Pacific. The breadth of this belt of country is about 1000 miles from north to south. The relief of the land, the mountain ranges, plateaus, plains, rivers and coasts have been already described.

The climate is very much like that of Canada, but increases in warmth from the northern states to the southern, which are nearer the Equator. All the central part lies open and unprotected, like Canada, from cold northerly winds and warm southerly winds, particularly the latter, for the States slope down to the south as Canada does to the north. This is clear from the course of the rivers (see Map). As in Canada, the climate of the Pacific coast is more maritime and the rainfall heavier than on the Atlantic. The rainfall of the inland states



NEWFOUNDLAND

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decreases from east to west, till there is not enough for agriculture without irrigation. This is the case in the great plains west of the prairies and the Great Basin. Few crops will grow with a less rainfall than 20 inches, and in these regions the rainfall is much less.

Products.—*Wheat* flourishes in the *northern* states lying south and west of the Great Lakes. Here the yield of wheat is enormous. In the *central* states *maize* (called corn in the States) is the chief crop. It is more important than any other, for it is used to feed cattle, which are raised in great numbers, as well as to feed men. From it is made cornflour, well known all over the world. In the *southern* states *cotton* is the great crop. It is by far the most valuable export of the States. Here also grow tobacco, rice, and sugar. The States produce more tobacco than any other country in the world. California, on the Pacific coast, is the chief fruit district.

Minerals. More coal, iron, and copper are produced in the States than in any other part of the world. The iron and copper are found around the Great Lakes. The yield of petroleum, chiefly in California, is second only to that of Caucasia in Russia. Gold, silver, and lead are mined largely in the western states, *e.g.* California, Colorado, and Alaska. Zinc and aluminium are also mined in large quantities.

Trade.—The *export* trade of the States is enormous, for quantities of raw material, *e.g.* coal, iron, copper, timber, grain, flour, cotton, petroleum, tobacco, and meat are produced, and much, not wanted for home use, is exported. For the needs of its own population of 100 millions, the country yields all that can be produced in a temperate climate. Its chief imports are the products of the Tropics, such as sugar, coffee, tea, rubber spices, silk, tin, and wool (of the camel and goat).

The *Manufactures* include nearly every article that is used by civilised mankind. At least 8 millions of people work in factories, making cotton, woollen, silk, leather, iron, and steel goods, and machinery, paper, and gas, motor-cars, and chemicals. Meat and fruit are packed in tin cans for export.

The *Railways* are the most extensive in the world. They run in every direction over 270,000 miles. Two lines, the Northern and Southern Pacific, cross the continent from the Atlantic coast to the Pacific.

Government. – There are 48 States united in a Federal Republic. The executive power is in the hands of a *President* (elected every four years), assisted by a Vice-President and a Cabinet of ten Ministers. The legislative power rests in a *Congress* or Parliament of two Houses—a *Senate* and *House of Representatives.* The Senate includes two members elected by every State. The Representatives are elected by the citizens (women may vote) Each State has also its own Governor, Senate, and House of Representatives, who manage its own State affairs.

The Population. The estimated population is about 106 million. It includes citizens from every country in Europe who have settled in America. The great majority are of British descent. About a million of immigrants come over every year. There is room for millions more.

Education is well looked after. It is not compulsory, but free in State schools, of which there are nearly 300,000. There are about 600 universities and colleges all over the States.

There are more large towns in the United States than in any other country. One town has a population of over 5 million, two of over 2 million, one of over 1 million, six more with over half a million, fifty-four more from 100,000 to 500,000, and fifty more from 50,000 to 100,000. Only a very few can be named.

TOWNS OF THE EASTERN STATES.

The States east and north-east of New York were called **New England** by the old English settlers, and this name they still keep. The largest manufacturing towns are found in these States, for they have the densest population; they are on the coast opposite to Europe, and they have many rivers which "fall" from the plateau on to the coastal plain and give plenty of water-power.

New York, the largest city and greatest seaport, after London, in the world, has 5½ millions of inhabitants, and in the suburbs there are 5 millions more. It is the most important port and town in America for trade, commerce, and manufactures. It is built on the little River Hudson. It owes its importance to its position, for it stands at the mouth of the Hudson Valley, leading through the Appalachian Mountains to the interior. This valley is the easiest route inland, and is used by roads, railways, and a canal. The large coal-fields in Pennsylvania close by give it coal for its many factories. More than half of the exports of the United States pass through New York. **Boston** (748) is second only to New York as a seaport. It is the chief wool market of the States, and has very large fisheries. **Philadelphia** (1828), the third city in the States for size and trade, and **Baltimore** (734) are both built on deep tidal harbours, which may be used by the largest steamers. They are both "gateways" to the rich country behind them, from which there are easy routes by railway and roads to these great cities. **Washington** (438), on the little River Potomac, is the capital of the United States.

TOWNS IN THE CENTRAL PLAINS.

The "Lake States" are fertile plains on which enormous crops of grain are grown. Great herds of cattle are raised on the maize not used for flour. And the lake country has the richest iron and copper mines in America. The lakes themselves are a splendid waterway for the transport of goods. These are the reasons why so many large towns have arisen in these States.

Chicago (2700) is one of the most remarkable cities in the world because of its wonderful growth. In 1830 it was a little village with about 100 inhabitants. The population is now about 2½ millions. It lies at the south end of Lake Michigan, and to it comes all the produce of the fertile lands of the North-West States for export by the great lake waterway and by railway to the Eastern States and to the outside world. It also imports manufactured articles from the east and sends them on to the north-west. The growth of this one city shows the growth of all the North-Western States in recent years. It is the greatest meat and grain market and the largest lake port and railway centre in the world. **Milwaukee** (457) is, next to Chicago, the largest town and port on Lake Michigan. It is a great centre of the lumber trade. **St. Louis** (773) stands just below the junction of the Mississippi and the Missouri. It is the largest city in the Mississippi valley, the great railway centre between the east and west, with enormous trade in grain and cattle. **Minneapolis** (381) stands below the waterfalls of the Mississippi in its upper course, and having much water-power from these falls, and also being in the centre of the grain country, has become one of the largest flour milling cities in the world. **Pittsburgh** (588), on the Ohio, is in the centre of a rich coal district, and is the greatest centre of the iron and steel trade in America. **Cincinnati** (401), another town on the Ohio, has a large trade in meat and grain. **New Orleans** (387), near the mouth of the Mississippi, is second only to New York in its foreign trade, and exports the cotton and tobacco of the Southern States, to which it is the natural gate.

Detroit (996) stands on Lake Michigan on the land route between Canada and the States. Here motor-cars are manufactured in large numbers. **Denver** (256), the largest city on the Great Plains, near the foot of the Rockies, is a great railway centre. It supplies the miners on the plateau with food and machinery, and transports the ore raised.

TOWNS OF THE FAR WESTERN STATES.

The most important of these towns is **San Francisco** (507), the great port of the United States on the Pacific coast. It exports the gold, the grain, and the fruits of California, and the timber of the forests on the slopes of the Rockies; also petroleum, now yielded more largely in California than in any other State. It has a magnificent harbour, and great trade with China and Japan.

99. CENTRAL AMERICA AND MEXICO.

THE great Republic of **Mexico** and the five little Republics of **Guatemala, Honduras, Nicaragua, Costa Rica,** and **Panama** all form a large isthmus uniting North and South America. Mexico is sometimes treated as a part of North America, and the term Central America limited to the five smaller Republics.

MEXICO

is a huge plateau rising westwards from the valley of the River Grande del Norte in great terraces 6000, 7000, and 8000 feet high. It has been made chiefly of lava piled up between two lofty ranges of mountains which rise above the plateau on the eastern and western sides. The ranges are known as the **Sierra Madre**. On them are lofty volcanic peaks, the chief being **Orisaba** (the Star Mountain), 18,250 feet, and **Popocatapetl** (the Smoking Mountain), 17,500 feet, both covered with eternal snow, the snow-line here being 15,000 feet.

On the south, the country narrows to 100 miles at the isthmus of **Tehuantepec**. Apart from the Grande del Norte, there is no large river in Mexico. The climate is tropical along the base of the mountains; temperate on the higher slopes and on the plateau up to 5000 feet; and cold on the summits and highest slopes of the mountains above 7000 feet. The rainfall exceeds 100 inches on the mountains, and is about 25 inches on the plateau.

Products.—The mountains are clothed with heavy forests containing mahogany and other valuable timber trees. The fruits of the country are the orange, pine-apple, banana, cocoa-nut, mango, papaw, and pomegranate. The sugar-cane, cacao, coffee, vanilla, and the agave or aloe are cultivated. From the aloe a kind of hemp (sisal) is made. On the cool plateau wheat and maize are largely grown. The riches of Mexico lie in its minerals gold, silver, copper, lead, platinum, coal, iron, mercury, and opals are all found. Mexico is one of the chief silver countries of the world. Petroleum is now yielded and exported in large quantities. The Government is that of a Republic under a President, and a Congress with two Houses—a Senate, and a House of Representatives elected by the people. The population (1912) was about 15½ millions The religion is Christian (Roman Catholic). The language is a form of Spanish, for Spain conquered and colonised this country. **Mexico** (1080), the capital, is on the plateau, 7000 feet high.

Acapulco, the chief seaport on the Pacific, has a very good harbour.

The **Central American Republics** are all, like Mexico, peopled by Spanish-speaking races, partly descended from the Spanish who mixed with the native Indians, and partly Indians. They are all mountainous; they lie within the Tropics, and the climate and products are tropical, very much the same as in Mexico. There is one large lake, **Nicaragua**, in the State of the same name. The total population is about 5 millions. Each of the Republics has a President and National Assembly or Parliament. The chief exports are coffee, gold and silver, bananas, mahogany, rubber, logwood, and indigo. **Guatemala** (90) is the largest town in Central America.

The **Panama Canal** measures about 41 miles from the Atlantic to the Pacific Coast. It varies in width from 300 to 1000 feet, and has a depth of 41 feet of water. The water surface is 85 feet above sea-level. Steamers are lifted in it by locks from level to level. It cost 75 millions of pounds sterling to make, and was opened in August 1915. It was built by the United States, who own the strip of land 5 miles north and 5 miles south of it. It is a "short cut" from the Atlantic to the Pacific. Thousands of miles are saved by steamers using this route, for they would otherwise have to sail all round South America.

100. SOUTH AMERICA.

Physical Features and Wild Animals

Shape and Build.—We have seen already that South America resembles North America in its general shape and build. Map

13 shows, in colours, the relief or different levels of the land. As in North America, there are three main natural divisions. These are : (1) lofty mountain ranges, stretching along the whole length of the western coast ; (2) lower highlands and plateaus on the eastern coast ; (3) a vast tract of lowland plains and low plateaus lying in the centre. In other words, the surface of South America consists of mountains on the west, mountains on the east, a plain in the middle.

The **Andes**, or Western Mountains, are the longest range of mountains in the world. They stretch without a break over a distance of 5000 miles. The system, often called the Cordillera, of the Andes is made up, like the Rockies, of two long parallel ranges, with a lofty plateau between them ; while a third, or coastal range, runs along the coast, and is continued in the south, where the ancient coast has sunk, by a long line of islands and fiords. The ranges on either side of the plateau are true folded mountains (see p. 47). All along the eastern side of the western range huge volcanoes have been piled up to thousands of feet above the plateau, being formed of lava. Earthquakes are frequent all along this tract. Many of these volcanoes are extinct, but some are still active. The highest are : **Aconcagua** (23,000 feet) in the south, **Illimani** (21,000) in the centre, and **Chimborazo** (20,800) and **Cotopaxi** (19,600) in the north. **Sorata** (22,000) is not volcanic.

The central plateau between the two ranges has been formed partly by lava flowing down from the volcanoes and partly by the soil washed down from the long ranges of mountains on either side. It is very lofty, being 12,000 to 14,000 feet above sea-level in many places. It widens out near the centre to a breadth of 500 miles, where it resembles the Great Basin of North America. Here it is known as the plateau of Bolivia, on which there is the large mountain lake **Titicaca**, 12,500 feet above the sea.

North and south of the Tropic of Capricorn there is an arid tract known as the **Atacama** desert, like the desert on the plateau in the Rockies in North America.

THE EASTERN HIGHLANDS

are divided into two great blocks by the basin of the Amazon (see Map 13). The northern is the **Plateau** (or Highlands) of **Guiana**, and the southern, the **Plateau** (or Highlands) of **Brazil.** Both of these are very ancient elevated blocks of land much older than the Andes. They have been weathered down, in the lapse of ages, into dissected plateaus and flat-topped mountains. The average level of the Brazilian plateau is between 4000 and 5000 feet, running up to 8000 feet near the Tropics; but on the Guiana plateau there are mountains 11,000 feet high, which bring down heavy rainfall from the moist easterly ocean winds.

THE CENTRAL LOWLAND REGION

includes the river basins of the three great rivers of South America—the Orinoco, the Amazon, and the La Plata. In a former far-distant age the sea covered all this region and spread a vast sheet of silt over it. Then the sea retreated, and fresh silt was washed down into it by the rivers. The vegetation on this vast tract of fertile soil depends upon the rainfall. Where the rainfall is heavy, as in the basin of the Amazon, there are dense dark tropical forests known as **Selvas** (p. 325). The Orinoco valley, with a lighter rainfall, is known as the **Llanos**, (p. 326), grassy plains lightly wooded. The plains in the basin of the La Plata are called **Pampas**. Here the rainfall is still lighter, and, like the prairies of North America, the open treeless Pampas (p. 328) are wide grazing grounds for cattle, though much of the land is cultivated for grain.

The **Amazon** (3400 miles), though not the longest river in the world, is the largest, *i.e.* it takes down to the sea more water than any other. It has countless tributaries, the chief tributary on the left bank being the Rio Negro from the north and the Madeira from the south, both mighty rivers themselves, as large as the Ganges. It has a wide estuary, up which the tides rush with great force. The enormous quantity of mud it brings down is deposited far out at sea (see the light blue showing shallow water opposite the mouth of the river on the map). The Amazon flows over very level country and is navigable for over 2000 miles from its mouth. The **Orinoco** (1550 miles) flows right round the base of the Guiana highlands, across the Llanos into the Atlantic. It is navigable to large steamers for 1000 miles. The **La Plata** is a wide estuary about 120 miles long, into which flow (1) the **Parana** (2400 miles), fed by the **Paraguay** (1500 miles), and (2) the Uruguay (931 miles). These rivers flow through immense fertile plains. The **Tocantins** (2280 miles) and the **Sao Francisco** (1800 miles) both flow across the Brazilian plateau in deep valleys which they have cut out for themselves.

THE CLIMATE.

Generally, as most of South America—quite four-fifths—lies within the Tropics, the climate in the lowlands is hot, particularly in the belt north and south of the Equator. In the south we get into the Temperate Zone, where it is much cooler. Even in the Tropics the air is cool, and even cold as we ascend the mountains and the lofty plateaus. The direction of the mountain ranges has also much to do with the climate, as in North America.

The rainfall in the Equatorial Zone on both the Atlantic and Pacific coasts is heavy. But south of this, *i.e.* from about lat. 4° S. to about lat. 30° S., the prevailing winds (the N.E. and S.E. Trades) are easterly, from the Atlantic (see Fig. 134). These winds blow right across the continent, over the basin of the Amazon, up to the Andes. Here they are stopped by this lofty range of mountains. The Pacific coast in this latitude is rainless, and much of it is a dry desert, the Atacama. But from about lat. 30° southward, the prevailing winds are westerly. They reach the Pacific coast, but not the Atlantic, for the Andes shuts them out. This is why the Pampas are so dry.

WILD ANIMALS.

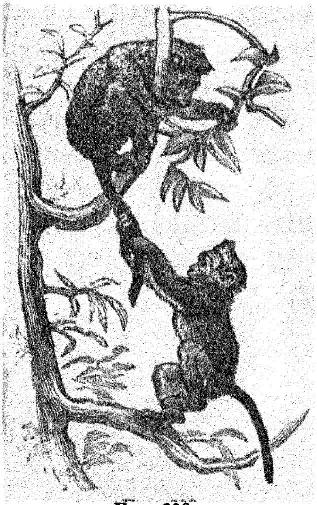

FIG. 202.
LONG-TAILED MONKEYS.

Long-tailed Monkeys. — None of the larger monkeys or apes is found in America. Instead of them there are large numbers of smaller monkeys of many kinds. They are different from the monkeys of the Old World in several ways. Nearly all the Old-World monkeys have cheek-pouches in which they carry food. These are wanting in the American monkey. Also the latter have no thumbs, or very small ones. But they all have long tails which are as good to them as another hand, for they can hang to a branch by them. They spend nearly all their lives in trees, only coming down when they want to drink.

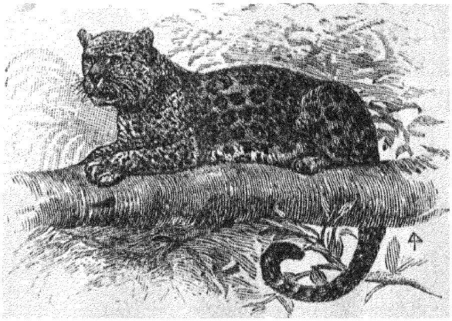

FIG. 203.—JAGUAR.

The *Jaguar* is a large leopard with spots like the Indian cheetah. It almost lives in the trees, and springs from one branch to another like a monkey. It kills and eats monkeys which swarm in the great forests of South America, and tapirs, and even fish, along the great rivers. It also catches birds. It is a larger animal than the puma, and is indeed the largest and most handsome of the cat-tribe in America.

The *Tapir* is found both in Central and South America. It looks something like a large pig. Its upper lip is lengthened out into a kind of trunk. Tapirs live in thick forests near the

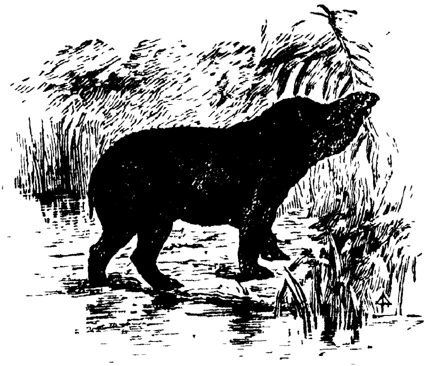

FIG. 204.—TAPIR

banks of great rivers, and come out at night to feed. They swim very well and are fond of bathing. Their great enemy is the jaguar, which is always on the watch for them.

The *Alpaca* is a small species of llama chiefly found in Peru, where the native Indians keep large flocks for the sake of their woolly hair, which is grey or black and grows to a length of two feet. Very fine warm cloth called alpaca is made out of it. It is now largely exported to England.

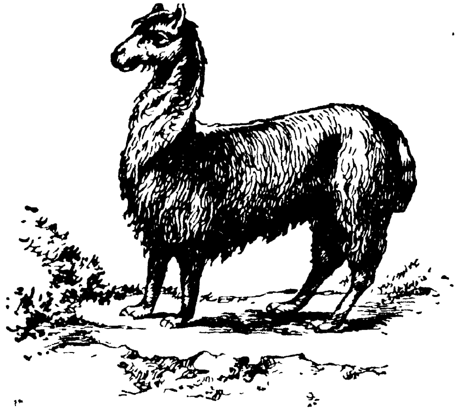

FIG. 205.—ALPACA.

The *Llama* may be called the South American camel, for it resembles the camel in some ways. But llamas are smaller, they have no humps on their backs, and their hoofs do not spread out like those of the camel. They have a thick woolly coat which grows in large masses. They are used in the Andes to carry goods, and the females are kept for milk. They stand about 3 feet high at the shoulder and 4½ feet to the top of the head. The hair or wool is woven into thick cloth.

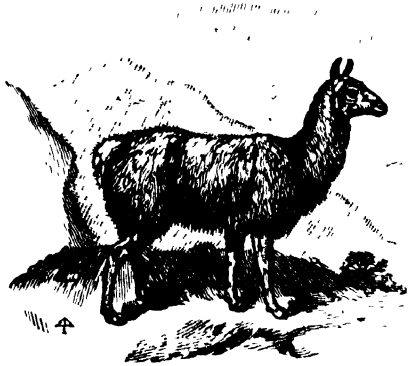

FIG. 206.—LLAMA.

The *Rhea* may be called the ostrich of South America. It is not nearly so large, but it is quite as swift of foot, and runs faster than a horse. The hen lays its eggs in the ground, but the cock sits on them and takes care of the young birds when they are hatched.

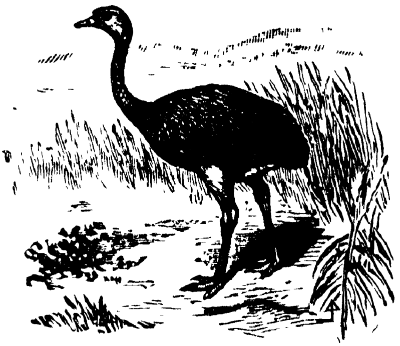

FIG. 207.—RHEA.

The *Condor* is the largest of the vulture kind. It inhabits the highest peaks of the Andes. These vultures usually eat dead llamas, but sometimes they join together if food be scarce and attack and kill sheep or cattle. They fly very high, three or four miles up in the air.

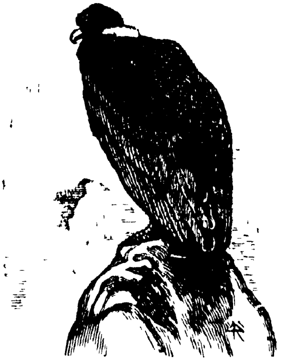

FIG. 208.—CONDOR.

The *Great Ant-eater* belongs to the class of toothless animals to which class belong also the sloth and the armadillo. It is about four feet long and two feet high; it has a very long head and mouth, and a very long narrow tongue which is very sticky. It lives on small insects like ants; when it shoots out its tongue, hundreds of ants stick to it and are taken into its mouth for food. It has a very long bushy tail with which it can cover its whole body.

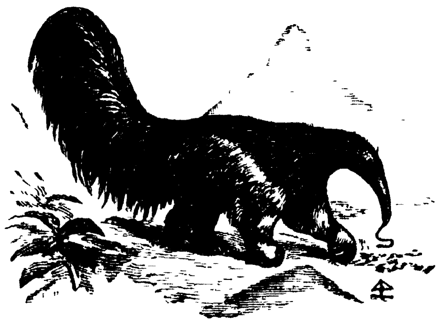

FIG. 209.—GREAT ANT-EATER.

The *Armadillo* is also toothless. Its body is quite covered by a kind of armour consisting of small bony plates growing in the skin. They are fastened together by bony rings, so that when the animal rolls itself into a ball, as it does when it sees an enemy coming, it is quite safe inside. It lives chiefly on ants of every kind, especially white ants, of which it is very fond.

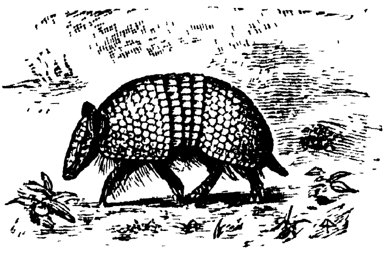

Fig. 210.—Armadillo.

The *Sloth* means the slow-moving animal. Sloths live almost wholly in trees. And while all other tree animals walk *upon* the branches, the sloth always walks *underneath* a branch as it is doing in the picture, hanging on by its great crooked claws. Sloths are always looking up at the sky with their backs downwards; they eat the leaves and tender twigs of trees.

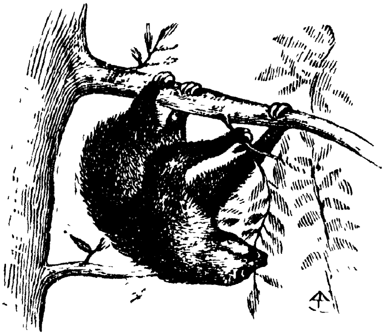

Fig. 211.—Sloth.

101. SOUTH AMERICA (*continued*).

Countries.

There are ten Republics in South America and three small provinces—British, Dutch, and French Guiana. The Government of each of the Republics is on the model of that of the United States, *i.e.* there is a Congress or Parliament and a President. All the Republics but Brazil belonged at one time to Spain, having been conquered and colonised about 400 years ago. One after another they became independent. They all contain a great many "half-breeds," descended from the Spanish and the old Indians of the country. The Spanish language is spoken everywhere. Four of the Republics, viz. Colombia, Ecuador, Peru, and Chile, are on the Pacific coast, but include also the plateau of the Andes opposite to it and are sometimes called the Andean States. Two more—Paraguay and Bolivia—lie inland, in the centre of the continent, and have no coast-line. The remaining Republics of Argentine, Brazil, Paraguay, and Venezuela, and the three provinces in Guiana have a coast-line on the Atlantic.

BRAZIL,

the largest country in South America, includes the whole of the vast basin of the Amazon. It is more than three-fourths the size of the continent of Europe, but much of it is covered by the dense forests of the Selvas. By far the most valuable export is coffee. The country produces four-fifths of the world's supply of coffee. Rubber (from the forests of the Amazon) comes next in value, and yields half the world's supply. Then come cocoa, leather and hides, tobacco, sugar, cotton, and maté. Maté is the leaf of a shrub which makes a kind of tea. Timber and dye-woods are obtained from the forests. Cotton-weaving is the chief manufacture. The population is about 31 millions.

Rio Janeiro (1156), the capital, is a great port on a beautiful bay, and has enormous exports of coffee and large imports. **Bahia** (348), the second port, exports sugar and tobacco, which grow in the country behind it. **Pernambuco** (216), on the north-eastern coast, has a good port, and exports cotton, sugar, and coffee from the district behind it. **Para**, near the mouth of the Amazon, is the great rubber port of Brazil.

Paraguay (population 1,000,000) is a river plain, the basin of the Paraguay. Yerba Maté (Paraguay tea) is the chief export, also tobacco. **Asuncion** (100) is the capital.

URUGUAY,

watered by the Uruguay, has splendid grazing grounds, and the chief industry is the rearing of cattle and sheep. Wheat is largely cultivated, also oats and linseed. Grapes grow well and much wine is produced. The chief export is wool, followed by meat, hides, and fat. The population is about 1½ million. **Montevideo** (362 the capital, is the chief port and railway centre.

THE ARGENTINE

is a large country 2000 miles from north to south, with a population of about 8½ million. It lies in the South Temperate Zone. The country in the north, called the Granchaco or Great Hunting-ground, is wooded. All the centre is the rich grass-land of the well-watered Pampas. The far south is a stony desert. The climate is warm in the north but gets colder towards the south. It is pleasant and healthy, and well suited for Europeans. Over 5 millions of emigrants have settled here in recent years, chiefly Italians and Spaniards.

The soil yields enormous crops of wheat, maize, and oats. More maize is exported than from any other country in the world. Great crops of flax are also grown for linseed. Cotton, sugar-cane, grapes, and tobacco are also cultivated. On the Pampas immense flocks of sheep and herds of cattle are pastured. The chief exports are wheat, wool, maize, linseed, hides, and meat. **Buenos Aires** (1674), the capital, is the largest city in South America. It is the chief port on the La Plata estuary, with enormous commerce, and the terminus of many lines of railway.

The **Falkland Islands**, off the south coast, belong to Britain. The chief industries are sheep-farming and whaling, the chief exports being whale-oil and wool.

CHILE

is a strip of country including the Pacific seaboard and the Andes above it. It has a population of 3¾ million. The southern coast is much broken by deep fiords fringed with countless islands. Here the climate is very cold. The northern region, lying north and south of the Tropic of Capricorn, is the rainless desert of Atacama. Yet this desert is rich in metals, especially copper and silver, and on the coast are very valuable deposits of the nitrate of soda and of guano which the dry climate has preserved. More than a million tons of the nitrate is exported to Europe for chemicals and manure. Guano is the droppings of sea-birds which come here to breed in countless numbers. It is used for manure. The central division is a beautiful valley lying between the Andes and the lower coast range, with a pleasant climate. Here wheat, barley, fruit, and tobacco grow well. The climate is temperate, owing to cool breezes blowing over cold ocean currents. This is the most populous part of the country. The chief exports are nitrates, guano, wool, grain, and copper **Santiago** (507), the capital, stands in the central valley, at the foot of the Andes. It is a fine town, with a University. **Valparaiso** (182), the chief port, is the terminus of the railway to Montevideo.

PERU

is the largest table-land in the world except Tibet. It has a population of about 4½ million. The soil on the slopes of the Andes is fertile, and here grow sugar, cotton, tobacco, rice, and grapes. The treeless plateau in the centre has very rich mines of silver and copper and petroleum, and is the home of the llama and the alpaca, whose wool is exported. Here also grow maize and potatoes. The eastern forests, or Montana, yield cacao, rubber, and coffee. On islands off the coast there are valuable deposits of guano.

The two highest railways in the world cross the Andes in Peru. One, at a height of 15,600 feet, connects Lima the capital with Oroya on the plateau; and another, at a height of 14,600 feet, runs from Lake Titicaca to the coast. The chief exports are copper, cotton, sugar, petroleum, gums, and guano. **Lima** (176), the capital, is on the coast six miles from its port **Callao** (52), with which it is connected by a railway.

ECUADOR

was so named by the old Spanish settlers because the Equator runs through it. It has a population of about 2 million. The great product of the country is cacao. Coffee is also grown. Rubber and nuts and quinine are obtained in the forests. **Quito** (70) is on the Equator, but, being at a height of 9000 feet, has a mild and pleasant climate. Only 40 miles off there is the volcanic mountain Cotopaxi, and earthquakes are frequent. **Guayaquil** (94), on the coast, is the chief port.

COLOMBIA

has a population of about 6 million. It lies in the Torrid Zone. The Andes run through it, dividing hot coastal plains on the west from hot river plains on the east. On the hot damp lowlands grow sugar-cane, rice, cacao, and bananas; on the cooler lower mountain-slopes there are plantations of coffee and fields of tobacco and maize; on the higher plateau grow wheat and potatoes. Large herds of cattle graze on the Llanos in the Orinoco basin in the east. "Panama hats" are made in large numbers. Coffee is the chief export, and after it, hides, bananas, and gold. **Bogota** (143), the capital, is 8000 feet above the sea-level.

VENEZUELA

is a great plain in the basin of the Orinoco, with a coast-line on the Caribbean Sea and highlands in the east. The population is about 2¼ million. The country has rich fertile plains growing coffee, cocoa, sugar-cane, maize, and cotton; large Llanos which graze herds of cattle; and forests on the highlands with timber, gums, rubber, and vanilla. The exports are coffee, cocoa, rubber, hides, cattle, and gold. **Caraccas** (92), the capital, is a valley 3000 feet high.

BOLIVIA

is a plateau in the widest part of the Andes, but includes densely wooded lowlands (Selvas) in the east. The population is about 3 million. On the plateau lies the mountain lake Titicaca, 12,500 feet above sea-level, the southern half being in Bolivia and the northern half in Peru. There are very rich silver mines, those near Potosi being very famous. In the forests grow cinchona, rubber, and cacao. This country was the first home of the potato, now known all over the world. The chief exports are silver, tin, and rubber. **Sucre** (30) is the capital, but **La Paz** (107) is the largest town.

GUIANA

is a block of country to the north of Brazil, lying between the highlands of Guiana and the Atlantic Ocean. Along the coast there is a low plain watered by many streams and rivers, very fertile but very hot and unhealthy. The plateau to the south is densely wooded. The country has been divided into three colonies, held by the British, Dutch, and French.

British Guiana has a coast-line of about 250 miles, and runs inland for 600 miles. The population is about 300,000. The chief product is sugar, and the capital **Georgetown**.

Dutch Guiana (or Surinam) (population 86,000) is about half the size of British Guiana, and resembles it very much. The products are sugar, cacao, rice, coffee, and bananas. The capital is **Paramaribo** (51)

French Guiana (population about 50,000).—Chief product pepper; capital **Cayenne**.

102. ISLANDS OF THE PACIFIC OCEAN.

ALL islands may be divided into two classes, Continental and Oceanic. *Continental* islands, *e.g.* Ceylon, are made of the same rocks as the continents to which they were once joined, and they have more or less the same plants and animals, which have reached them by land. *Oceanic* islands have never formed parts of any existing continent; they have been built up in the open ocean either by corals or by volcanoes (see pp. 51, 58). They have very few plants and animals, only such birds or insects as can fly across the ocean, or animals, like mice and rats, which may drift across on floating logs. The men who inhabit these islands must have come to them on rafts or boats in bygone ages.

The chief continental islands have been described in connection with the continents to which they belong. The oceanic islands are sometimes called, as a whole, Polynesia[1] (*many* lands) or Oceania (*ocean* lands). They are also known as the islands of the Pacific, for the islands in the Atlantic and other oceans are nearly all continental. Sometimes the term **Melanesia**[2] is applied to the groups north of Australia (including New Guinea) because their inhabitants are dark-skinned. Most of the islands (see Map 5) are in the Tropics, and the climate is hot and damp, but equable, for the ocean winds sweep over them. The larger islands are mountainous and densely wooded. The chief products are cocoa-nuts and bread fruit. The islanders live mainly on fish. On some of the larger islands rice, maize, cotton, sugar-cane, and plantains have been brought over by Europeans, and grow well.

The number of those islands is very large. Many of the largest belong to the British. These are underlined in red on the map. The most important are the **Sandwich Islands,** also called **Hawaii,** on the Tropic of Cancer, in the centre of the North Pacific. On them there are volcanic mountains nearly 14,000 feet high. They belong to the United States. The capital is **Honolulu,** which has a good harbour. It may be called the Nodal Island of the Pacific (see Map 5), for steamers meet here from all parts of the world. Ten lines of steamers connect Honolulu with the United States, Canada, Australia, New Zealand, China, and Japan. The islands are very fertile; the chief products are sugar and pine-apples, also coffee, bananas, rice, and tobacco.

The **Fiji Islands** (British), about 200 in number, produce sugar, cocoa-nuts, and rice.

The names of the other islands and island groups may be seen on the Map.

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[1] Greek *Polus* or *Polys* = many.

[2] Greek *Melan* = black.

APPENDIX I.

THE BRITISH EMPIRE, 1920–21.

	Area. Square Miles.	Population.	Total Exports.[1]	Total Imports.[1]
			£	£
United Kingdom	121,633	47,308,000	810,248,000	1,086,687,000
Europe :				
Gibraltar	2	18,000	...	...
Malta	118	225,000	919,000	4,262,000
Total Europe . . .	120	243,000	919,000	4,262,000
India	1,802,629	319,075,000	282,148,000	358,845,000
Asia (except India) :				
Cyprus	3,584	311,000	1,200,000	2,069,000
Aden, Perim, and Socotra . .	10,387[2]	67,000	5,367,000	6,495,000
Ceylon	25,481	4,504,000	18,420,000	24,062,000
Straits Settlements	1,600	882,000	119,472,000	148,191,000
Federated Malay States . .	27,506	1,316,000	33,683,000	19,894,000
Other Malay States . . .	23,486	1,123,000	10,042,000[3]	6,551,000[3]

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[1] The imports include bullion and specie ; and the exports, bullion and specie and re-exports.

[2] Including area of Protectorate.

[3] Incomplete.

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THE BRITISH EMPIRE, 1920–21—*continued.*

	Area. Square Miles	Population.	Total Exports.[1]	Total Imports.[1]
Asia (except India)—contd.			£	£
Borneo, Brunei, and Sarawak .	77,106	1,000,000	3,651,000	3,081,000
Hong Kong and Territory . .	391	625,000	153,663,000	135,687,000
Wei-hai-wei	285	147,000	. .	. .
Total Asia (except India) .	169,826	9,975,000	345,498,000	346,030,000
Australasia :				
Australian Commonwealth . .	2,974,581	5,437,000	132,029,000	163,334,000
Papua	90,540	251,000	171,000	485,000
New Guinea	89,252	395,000	674,000	661,000
New Zealand	104,751	1,219,000	46,442,000	61,596,000
Samoa	1,250	37,000	387,000	561,000
Nauru	10	2,000	150,000	109,000
Fiji	7,083	155,000	2,896,000	1,673,000
Tonga, Solomon, & Gilbert Islands	11,450	265,000	841,000	647,000
Total Australasia . .	3,278,917	7,761,000	183,690,000	229,066,000

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[1] The imports include bullion and specie; and the exports, bullion and specie and re-exports.

THE BRITISH EMPIRE, 1920–21—*continued.*

	Area. Square Miles.	Population.	Total Exports.[1]	Total Imports.[1]
Africa :			£	£
Ascension	34	...	. .	...
St. Helena	47	4,000	67,000	42,000
West Africa :				
Nigeria	332,000	16,250,000	16,987,000	25,217,000
Cameroon	31,000	400,000	140,000	167,000
Gold Coast and Protectorate .	80,000	2,030,000	10,814,000	7,947,000
Togoland	12,600	300,000	851,000	665,000
Sierra Leone and Protectorate .	31,000	1,400,000	2,949,000	3,548,000
Gambia and Protectorate . .	4,500	248,000	2,466,000	2,712,000
Total West Africa . .	491,181	20,632,000	34,274,000	40,298.000
Mauritius and Dependencies .	809	376,000	8,500,000	6,412,000
Seychelles	156	25,000	127,000	114,000
Somaliland	68,000	300.000	231,000	357,000
Kenya Colony and Protectorate .	245,060	2,600.000	5,061,000	6,919,000
Tanganyika	365,000	4,000.000	1,282,000	1,729,000
Uganda Protectorate . . .	109,119	3,072,000	4,134,000	.
Zanzibar and Pemba . . .	1,020	197,000	3.011,000	2,738,000
Nyasaland	39,573	1,200,000	670,000	508,000
Union of South Africa . .	473,100	6,923,000	87,668,000	101,827,000
South-West Africa . . .	322,000	237,000	1,056.000	656,000

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[1] The imports include bullion and specie ; and the exports, bullion and specie and re-exports.

THE BRITISH EMPIRE, 1920–21—*continued.*

	Area. Square Miles.	Population.	Total Exports.[1]	Total Imports.[1]
Africa—contd.:			£	£
Rhodesia	440,000	1,736,000	5,698,000	5,239,000
Swaziland	6,678	134,000	[2]	[2]
Basutoland	11,716	501,000	937,000	1,219,000
Bechuanaland	275,000	153,000	[2]	[2]
Anglo-Egyptian Sudan	1,014,000	3,400,000	5,323,000	7,608,000
Total Africa	3,872,412	45,486,000	127,127,974	85,624,000
America:				
Canada	3,729,665	8,700,000	255,183,000	247,000,000
Newfoundland and Labrador	162,734	267,000	4,629,000	5,962,000
British Honduras	8,592	45,000	1,038,000	1,209,000
British Guiana	89,480	298,000	6,143,000	5,179,000
Bermuda	19	22,000	266,000	1,414,000
West Indies:				
Bahamas	4,404	53,000	300,000	1,090,000
Turk's and Caicos Islands	224	6,000	47,000	60,000
Jamaica	4,207	858,000	7,146,000	10,313,000
Cayman Islands	89	5,000	...	...
Barbados	166	198,000	4,866,000	5,146,000
Windward Islands	516	172,000	1,359,000	1,416,000

[1] The imports include bullion and specie; and the exports, bullion and specie and re-exports.

[2] Included in figures for South Africa.

THE BRITISH EMPIRE, 1920–21—*continued.*

	Area Square Miles.	Population.	Total Exports.[1]	Total Imports.[1]
America—contd.:			£	£
Leeward Islands . . .	715	127,000	1,173,000	975,000
Trinidad and Tobago . .	1,974	391,000	9,417,000	8,209,000
Total West Indies . .	12,295	1,810,000	15,308,000	27,209,000
Falkland Islands . . .	7,500[2]	3,000	2,176,000	1,022,000
Total America . . .	4,010,285	11,145,000	293,743,000	288,995,000
SUMMARY.				
United Kingdom . . .	121,633	47,308,000	810,248,000	1,086,687,000
Europe	120	243,000	919,000	4,262,000
India	1,802,629	319,075,000	282,148,000	358,845,000
Asia (except India) . . .	169,826	9,975,000	191,988,663	210,488,687
Australasia	3,278,917	7,761,000	183,690,000	229,066,000
Africa	3,872,412	45,486,000	127,127,974	185,624,000
America	4,010,285	11,145,000	293,743,000	288,995,000
Total	13,255,822	440,993,000	1,889,864,637	**2,934,967,687**

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[1] **The imports** include bullion and specie ; and the exports, bullion and specie and **re-exports.**

[2] Including South Georgia, 1000 square miles and population 1000.

APPENDIX II.

BRITISH INDIAN PROVINCES.

AREA AND POPULATION CENSUS OF 1921.

British Provinces.	No. of Districts.	Area in Square Miles (1921).	Population (1921).
Ajmer-Merwara	2	2,711	495,899
Andamans and Nicobars	3	3,143	26,833
Assam	12	53,015	7,598,861
Baluchistan[1]	7	54,228	421,679
Bengal	28	78,699	46,653,177
Bihar and Orissa	21	83,181	33,998,778
Bihar	*11*	*42,361*	*23,378,758*
Orissa	*5*	*13,743*	*4,968,406*
Chota Nagpur	*5*	*27,077*	*5,651,614*
Bombay (Presidency)	26	123,059	19,338,586
Bombay	*20*	*75,993*	*16,005,170*
Sind	*6*	*46,986*	*3,278,493*
Aden	..	*80*	*54,923*
Burma	41	230,839	13,205,564
Central Provinces and Berar	22	99,823	13,908,514
Central Provinces	*18*	*82,057*	*10,827,302*
Berar	*4*	*17,766*	*3,081,212*
Coorg	1	1,582	164,459
Delhi	..	557	486,741
Madras	24	142,330	42,322,270
N.-W. Frontier Province[1]	5	13,418	2,247,696
Punjab	30	99,222	20,678,393
United Provinces	48	107,267	45,590,946
Agra	*36*	*83,109*	*33,420,638*
Oudh	*12*	*24,158*	*12,170,308*
Total		1,093,074	247,138,396

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[1] Districts and Administered Territories.

APPENDIX III.

NATIVE STATES.

AREA AND POPULATION IN 1921.

With the Province or Agency to which they belong.

State or Agency.	Area in Square Miles (1921).	Population (1921).
Assam State (Manipur) . .	8,456	383,672
Baluchistan States . .	80,110	378,999
Baroda State	8,182	2,121,875
Bengal States . . .	5,393	896,173
Bihar and Orissa States . .	28,648	3,965,431
Bombay States . . .	63,861	7,412,341
Central India Agency . .	52,260	6,004,581
Central Provinces States .	31,174	2,068,482
Gwalior State . . .	25,107	3,175,822
Hyderabad State .	82,698	12,453,627
Kashmir State . . .	84,432	3,322,030
Madras States .	10,549	5,460,029
Cochin	1,361	979,019
Travancore . . .	7,594	4,005,849
Mysore State	29,475	5,976,660
N.-W. Frontier Province (Agencies and Tribal areas) .	25,472	2,828,055
Punjab States . . .	36,551	4,415,401
Rajputana Agency . . .	128,987	9,857,012
Sikkim State . . .	2,818	81,722
United Provinces States . .	5,079	1,134,824
Total States .	709,555	71,936,736
Total India .	1,802,629	319,075,132

APPENDIX IV.

AREA, POPULATION, AND RULING FAMILIES OF THE LARGER NATIVE STATES.

States.	Area in Square Miles.	Population (1921).	Ruling Family.
Gwalior . .	25,107	3,175,822	Mahráttá (Hindu)
Kashmír . .	84,432	3,322,080	Dogra Rájput (Hindu)
Ráјputána States .	128,987	9,857,012	...
Alwar . .	3,141	708,982	Naruka Rájput (Hindu)
Bharatpur . .	1,982	496,437	Ját (Hindu)
Bikaner . .	23,315	660,656	Rathor Rájput (Hindu)
Bundi . .	2,220	187,068	Chauhan (Hara) Rájput (Hindu)
Dholpur . .	1,155	229,734	Ját (Hindu)
Jaipur . .	15,579	2,329,087	Kachhwaha Rájput (Hindu)
Jaisalmer . .	16,062	67,701	Jadon Bhati Rájput (Hindu)
Jodhpur (Marwar)	34,963	1,841,642	Rathor Rájput (Hindu)
Karauli . .	1,242	133,730	Jadon Rájput (Hindu)
Kotah . .	5,684	629,962	Hara Rájput (Hindu)
Tonk . .	2,553	287,898	Pathan, *M.*
Udaipur (Mewar)	12,756	1,393,283	Sisodiya Rájput (Hindu)
Central India States	52,260	6,004,581	...
Bhopal . .	6,902	691,299	Afghán, *M.*
Indore . .	9,469	1,148,104	Mahráttá (Hindu)
Rewa . .	13,000	1,401,672	Bhagel Rájput (Hindu)
Bombay States .	63,864	7,412,341	...
Cutch . .	7,616[1]	484,526	Jadeja Rájput (Hindu)

M.=Muhammadan.

[1] Excluding the Runn of Cutch.

AREA, POPULATION, AND RULING FAMILIES OF THE LARGER NATIVE STATES—*continued.*

States.	Area in Square Miles.	Population (1921).	Ruling Family.
Kolhapur (includ. feudatory Jagirs)	3,217	832,376	Kshatriya (Hindu)
Khairpur (Sind) .	6,050	193,152	*M.*
Junagadh . .	3,284	465,221	Pathan, *M.*
Navanagar .	3,791	345,040	Jadeja Rájput.
Bhavnagar .	2,860	425,955	Gohil Rájput.
Madras States .	10,084	5,460,029	...
Travancore .	7,129	4,005,849	Kshatriya (Hindu)
Cochin . .	1,361	979,019	" "
Banganapalle .	255	36,646	Shiah, *M.*
Pudukkottai .	1,178	426,829	Kallar (Hindu)
Sandur . .	161	11,686	Maratha (Hindu)
Central Prov. States	31,174	2,068,482	...
Bastar . .	13,062	464,137	Kshatri, Somvanshi Chandel (Hindu)
Bihar and Orissa States . .	45,941	3,965,431	...
Bengal States			
Cooch Behar .	1,307	592,372	Kshatriya (Brahmo)
Tripura . .	4,086	303,801	Kshatriya (Hindu)
U.P. States . .	5,944	1,134,824	...
Rampur . .	899	453,607	Saiyid Shiah, *M.*
Tehri (Garhwál) .	4,180	318,482	Kshatriya (Hindu)
Benares . .	865	362,735	Hindu
Punjab States .	36,551	4,415,401	...
Patiála . .	5,412	1,499,537	Sidhu Ját (Sikh)
Baháwalpur .	15,000	781,114	Daudputra, *M.*
Jínd . . .	1,259	308,183	Sidhu Ját (Sikh)
Nábha . .	928	263,209	" "
Kapúrthala .	630	284,070	Ahluwalia "
Mandi . .	1,200	185,098	Rájput (Hindu)
Sirmur (Náhan) .	1,198	140,468	" "
Chamba . .	3,216	141,883	" "

M. = Muhammadan.

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